SEASONAL VARIABILITY STUDY ON THE GENETIC AND NUTRITIVE QUALITIES OF SELECTED GOLDEN MELON GENOTYPES

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A DISSERTATION SUBMITTED TO THE DEPARTMENT OF CROP AND SOIL SCIENCES, COLLEGE OF AGRICULTURAL SCIENCES, LANDMARK UNIVERSITY, OMU-ARAN, IN PARTIAL FULFILLMENT OF THE REQUIREMENTS FOR THE AWARD OF THE DEGREE OF MASTER OF SCIENCE (M.Sc.) IN CROP SCIENCE

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DECLARATION

I, **Ayodele Tunmise ONI**, a ***masters*** student in the ***Crop and Soil Science Department***, Landmark University, Omu-Aran, hereby declare that this thesis entitled "***Seasonal Variability Study on the Genetic and Nutritive Qualities of Selected Golden Melon Genotypes***", submitted by me is based on my original work. Any material(s) obtained from other sources or work done by any other persons or institutions have been duly acknowledged.

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CERTIFICATION

This is to certify that this thesis has been read and approved as meeting the requirements of the Department of ***Crop and Soil Science***, Landmark University, Omu-Aran, Nigeria, for the Award of ***Master of Science***.

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DEDICATION

To the glory of my Lord and savior Jesus Christ, this study is dedicated to my wonderful and ever supportive family.

To my parents, Pharm. And Mrs. J.A.S ONI, your love, perseverance, commitment and dogged faith saw this through.

To my siblings, Grant, Evelyn and Priscilla ONI, your never ending support, encouragement, prayer and love indeed refreshes the soul during tough breaks.

Thank God I have you, I love you with the whole of my heart.

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ABSTRACT

The role of agriculture in enhancing global food security is mostly dependent on various research that work with variations across genus and species to develop improved varieties that are high yielding and tolerant to adverse external factors, emphasizing the importance of genetic variability. Five golden melon genotypes (*Cucumis melo* L.) were evaluated in a study conducted on field and screen house experiments during rainy and dry seasons to study their genetic and nutritive qualities and estimate; degree of heritability, genetic variability, correlation amongst traits and path co-efficient. The vine length, number of branches, number of flowers, number of fruits, fruit size, fruit length, fruit weight, and number of seeds, days to 50% flowering and days to fruit initiation were the measured agronomic characteristics. The season effect was significant on vegetative traits with early season genotypes recording significantly higher vegetative characters than the late season genotypes in the following characters; vine length at 4 and 6 WAT in the field experiment at 79.43cm and 158.90cm respectively, vine length at 2 and 6 WAT in the screen house experiment at 32.78cm and 139.92cm respectively, number of branches at 6 WAT (4.07) in the field experiment and number of branches at 6 WAT (3.80) in the screen house experiment. Caribbean queen F1 (V5) recorded significantly longer vine length at 2, 4 and 6 WAT (32.13cm, 59.78cm and 100.50cm respectively) in the field experiment at, Epsilon F1 (V3) had longest vine at 2 WAT (33.11cm) in the screen house experiment, Delta F1 (V4) recorded longest vine at 6 WAT (121.61cm) in the screen house experiment, Delta F1 (V4) also recorded most branches (4.11) in the field experiment and Caribbean queen F1 recorded most branches (3.44) in the screen house experiment. Early season genotypes had significantly higher reproductive characters than late season genotypes in all the reproductive characters (number of flowers per branch at 6 WAT, number of flowers per plant at 4 and 6 WAT, number of fruits per plant, fruit size, fruit weight and fruit length in the field and screen house experiments) except in;

number of flowers per branch at 4 WAT in field and screen house experiments, fruit length in screen house experiment and number of seeds per fruit in field and screen house experiments. Epsilon F1 (V3) recorded significantly higher reproductive characters than other genotypes for most of the traits except in; number of flowers per branch at 4 and 6 WAT in field and screen house experiments, number of flowers per plant at 4 and 6 WAT in field experiment, number of flowers per plant at 6 WAT in screen house experiment and number of fruits per plant in field and screen house experiments. Most traits in the four environmental conditions recorded high coefficient of variation and high degree of heritability; from an observation during the study, number of flowers per branch at 6WAT recorded 54.36%, 46.79%, 81.32% and 59.51% coefficient of variation in early and late season field and screen house experiments respectively, 95.41% and 79.22% broad sense heritability in the early season field and screen house experiments, genes controlling traits with high broad sense heritability will most likely be inherited by offspring. Caribbean queen F1 (V5) and Delta F1 (V4) genotypes are recommended for cultural practices such as cover cropping and green manure composting. Epsilon F1 (V3) is recommended for further research for possible cultivation for reproductive parameters. DAYO F1 (V1) recorded highest values for protein (1.75%), carotene (0.10%) and vitamin A (4.90%) per twenty (20) grams of fresh fruit sample in the field experiment and 0.83%, 0.05% and 2.73% respectively, in the screen house experiment in its fruit samples. From study of inter-relationship between traits and relationship between selected traits and fruit yield, practices that will enhance vine growth are recommended to researchers so as to increase the yield of golden melon genotypes.

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CHAPTER ONE

1.0 INTRODUCTION

Figure 1: Pictures of the local variety DAYO F1 and Caribbean Queen

1.1 Background to the problem:

Golden melon or sweet melon with the botanical name *Cucumis melo* belongs to the Cucurbitaceae family, it is an economically important tropical vegetable of the ancient world, originating from Africa and Asia; it is globally distributed both in domestic and the wild (Pitrat 1991). Its genus *Cucumis* with broad wild distribution is from wider range including; central and South Africa, north Australia and southern Asia consists of 66 species (Sebastian, Schaefer, Telford & Renner, 2010). However, the origin of melon has been disputed, since there are arguments about melon originating from either South Africa or South Asia. Although South Asia indeed have a high melon varieties diversification, Cucumis species with a chromosome number; n=12, with the exception Cucumis hystrix, have their origin from Africa and have been grouped under the African classification by earlier researchers (Kroon, Custers, Kho, 1979). Thirty one (31) species have a chromosome number of n=12 among the over sixty species discovered with the sole exception of Cucumis sativus (cucumber), a relative of Cucumis melo with a chromosome number n=7 and having its origin from Asia (Kirkbride, 1993; Janssens, Mierowska, Hindorf, & Chen, 1999). Though succeeding literature reviews about the origin of golden melon strongly supports findings that suggests Eastern and South Africa as its origin (Kerje and Grum, 2000), melon has a long history of cultivation in Asia with evidence from ancient records discovering its cultivation about 2000 BC in China (Keng, 1974). Several cultivars have evolved from the specie giving rise to significant diversification in their fruit characters as cultivation continuously spread in the sub-tropics and tropical regions.

From residue of domestication, melon was spread in the wild from fruit residues giving rise to wild cultivars free from the breeding efforts of man. Occasionally found in very dry areas, habitats of wild golden melon cultivars are usually near human population sites, farming areas

and riverbeds. Wild cultivars are geographically distributed as thus: Asia: Philippines, Malaysia, Indonesia, Myanmar, Korea, Japan, Iran, Nepal, Thailand, Saudi Arabia, Yemen, India, China and Pakistan. Africa: Nigeria, Senegal, Angola, Cameroon, Central African Republic, Benin, Cape Verde Islands, Chad, Cote d'Ivoire, Egypt, Ethiopia, Ghana, Guinea-Bissau, Kenya, Malawi, Maldives, Mali, Mozambique, Niger, Seychelles, Somalia, South Africa, Sudan, Tanzania, Uganda, Zambia and Zimbabwe. Pacific: Australia, Fiji islands, Guam, New Britian, Samoa, Papua New Guinea, Solomon Islands and Tonga (Kirkbride, 1993).

The Nigerian local and most popular variety 'DAYO' is a little bit oval in shape, slightly flattened at the top and bottom, with a smooth yellow skin (exocarp), creamy white mesocarp with seeds that are all edible. The mesocarp is delicious having a characterized taste with combination of apple, watermelon and guava. With over 80% water content, golden melon also contains ascorbic acid (vitamin C), pantothenic acid, calcium, zinc, vitamin B6, magnesium, potassium, retinol and fibre.

Golden melon fruits vary in size and shape but most varieties have round fruits. Though morphology of melon is remarkably stable for some characters of particular organs, others characteristics of the same organ the morphology of the same organ can be highly variable (Kirkbride, 1993). In Purseglove's description of golden melon in 1968, he described it as a variable, trailing, softly hairy annual vine which maybe andro-monoecious or monoecious, with quite extensive superficial rooting system and stems that are ridged or striate. Petiole 4-10 cm long; tendrils simple; leaves orbicular or ovate to reniform, angled or shallowly 5-7 lobed, 8-5 cm in diameter, dentate, base cordate; leaves orbicular or ovate to reniform, angled or shallowly 5-7 lobed, 8-5 cm in diameter, dentate, base cordate; leaves orbicular or ovate to reniform, angled or shallowly. Flowers 1.2-3.0 cm in diameter, yellow, staminate and clustered, pistillate

and solitary, or hermaphrodite, on short stout pedicles; calyx 5-lobed, 6-8 mm long; corolla profoundly 5-partite, petals round, 2 cm long; stamens 3, free, anthers connectives protracted; pistil with 3-5 placentas and stigmas. Fruits are globular or oblong in shape, smooth or yellow-brown in color, or green in color, with yellow, pink, or green flesh and many seeds. Seeds are 5-15 mm long, whitish or buff, flat, smooth, and whitish or buff.

The stamen and pistil are not located on the same flower. At flowering, melon bears both the staminate male flower and pistillate female flower on the same plant, melon is therefore cross and self pollinated. Depending on the variety, melons are some monoecious but mostly andromonoecious with small flowers that are 2-3cm in diameter and are yellow coloured to aid insect pollination (Miriam, Osto, & Harry, 2012).

Unripe golden melon fruits remain tasteless until fruit fully matures. Sweetness in golden melon fruit is developed at one or two weeks before full maturity as a result of accumulation of sugar in the mesocarp cells, sucrose concentration is lesser at two weeks before full maturity and highest at full maturity which is usually around 3 months after transplanting (Cohen, Blaier, Schaffer, & Katan, J. 1996; Burger et al., 2003). Sweetness in golden melon is expressed as a result of the effect of a recessive gene, further research on this recessive gene and its consideration in breeding programs came to lime light in the beginning of the 21st century (Burger et al., 2003). The gene responsible for sweetness was first considered in Southwestern Asia and the expressed sweetness trait first selected in this region from the pioneering sweet melons introduced from southwestern Asia into the Europe around the end of the 15th century (Cohen et al., 2014).

Ripening of melon fruits involves series of complex metabolic reactions originating from changes in hormonal levels, enzymatic activity, cellular organization and respiratory activity.

The most easily perceptible sign of approaching fruit maturation is a yellowing of external color. During ripening, the mesocarp softens, due to increasing degradation of accumulated soluble sugar and cell walls, organic acids, and volatiles. There is morphological variability among the melon species especially in their phenotypic traits like the vine length and fruit characteristics such as fruit length, colour, shapes ranging from globular to elongate, weights range from few grams to kilogram and texture can be identified and differentiated (Monforte, Garcia-Mas, & Arus, 2003). Being a part of the human diet, fruits and vegetables including golden melon are important as they contain various vitamins, minerals and anti-oxidants and consuming them has been shown to contribute nutritional and health benefits to the body. Anti-oxidants such as flavonoids, cinnamic acids, folic acid, ascorbic acid, tocopherols, tocotrienols, benzoic acid and carotenoids that are synthesized in plants and are known to help prevent cancerous growths and remove dangerous radicals from the body (Ganji, Singh, & Friedman, 2019). The most popular ones are ascorbic acid, alpha tocopherol and beta-carotene, beta-carotene is found in substantial amount in golden melon Anti-oxidants fortify and improve health by preventing certain degenerative diseases such as diabetes, gastro intestinal tract disorder and cancer (Olubunmi, Olajumoke, Bamidele, & Omolara, 2019).

Almost all the cultivated species belonging to the cucurbits family are susceptible to viral, bacterial, fungal diseases and insect pests (Lebeda and Cohen, 2011). Therefore breeders grow landraces and wild relatives of these crops in screen houses for beneficial traits that can be used in crop improvement programs. For golden melon, these attempts so far have been complicated by the limited information available on agronomic and nutritive attributes of golden melon, especially in Nigeria.

1.2 Statement of the problem

Even though the varietal members of the speies *Cucumis melo* L. originated from tropical Africa and other parts of the world, their cultivation is not popular in Nigeria. This is due to limited information on the nutritive qualities of *Cucumis melo* L. Aside *Cucumis melo varagrestis* (egusiwewe) which is cultivated in Niger and Benue state for its seeds (Adekunle and Oluwo, 2008) and the local variety DAYO that is popular in the northern part of the country, little is known about the phenotypic, genotypic and nutritive qualities of other varieties like the cantaloupe and the caribbean queen in Nigeria.

Cucumis melo L. varieties can be cultivated under various environmental conditions; rain feed, irrigated, open field or screen housed. There is need for availability of information about the adaptability of various varieties for varying conditions.

1.3 Justification for the study

This research will provide scientific information about the five melon genotypes under study; information about their phenotypic, genotypic and nutritive qualities will aid researchers, breeders and farmers in future research, development of new varieties and in selecting the richest genotype for possible commercial production. Being highly diversified for traits such as fruit shape, size, skin color, skin texture, mesocarp/flesh color and sugar content, *Cucumis melo* sub-species are characterized with significant variability in their phenotypic and nutritive properties (Burger et al., 2006), creating research interests in this group to provide sufficient information on the phenotypic, genetic and biochemical attributes of the sub-species that will inspire innovation and create background for bringing new melon cultivars with the desired combination of traits important to farmers and breeders through introgression and gene recombination. Conducting the

research in early and late seasons, on field and screen house will help agronomists in selecting the most productive genotype under these conditions.

1.4 Objectives of the study

The main objective of the research was to study the phenotypic and nutritive qualities of the following *Cucumis melo* L. genotypes under different environmental conditions;

EPSILON F1 (hybrid muskmelon)

OMEGA F1

DELTA F1

CARRIBEAN QUEEN F1(cantaloupe)

DAYO F1.

Specific objectives of the study include:

i. to identify and study variation in the phenotypic characters and nutritive composition of selected melon genotypes due to season and genotype effects;
ii. to study genetic variability and heritability of the golden melon traits; and
iii. to study relationship within golden melon traits and with fruit yield under different environmental conditions.

1.5 Scope of the study

The focus of the study is on the differences between the observed phenotypic traits and nutrient composition of five *Cucumis melo* L. genotypes that are planted on the field and screen house of the Research Farm of Landmark University during both the early and late season of 2020.

1.6 Significance of the study

Seasonal study of the performances of cultivars, genotypes, landraces or varieties in different seasons will help to identify best planting season, study variation in vegetative, reproductive and nutritive parameters of golden melon genotypes due to season and genotype effect and studying of the relationship between traits, which will lay foundation for future works of breeding where researchers can refer to the information provided for selection or literature purposes.

CHAPTER TWO

2.0 REVIEW OF LITERATURE

2.1 Conceptual issues

Food security is a major challenge faced by developing countries due to continuous reduction in the availability of arable lands, water resources and climatic change as most countries in the sub-Sahara Africa and other parts of the globe are battling dessert encroachment on all fronts. As a result of this turn of event, sustainable agriculture can no longer depend on the conventional farming method of producing various agricultural crops only in the raining season (Tsoho and Salau, 2012). To meet the demand for food, efforts are being made by researchers and farmers to substitute seasonal production of cereals and vegetables with bi-seasonal production to ensure food supply both in the raining and dry season (Finlay & Wilkinson, 1963). The success of these efforts is based on seasonal variability performance studies of crops under different environmental conditions, varietal trials of plant species of interest are conducted to observe their performances in both raining and dry season, to indicate varieties that are best adapted to either raining or dry environmental condition and for possible genetic improvement of selected crops for better adaptability to a specific geographical location, as long as the limiting factor; water is supplied (Stuecker, Tigchelaar, & Kantar, 2018). In studies where the seasonal climatic factors have little or no effect on the yield and production of certain crops and vegetables, production of such crops will ensure ‘double harvest’ especially in areas with access to abundant water where farm irrigation can be practiced in the dry season meaning production is all year round (Jinlong et al., 2020). Research aimed at developing cultivars that are adapted to harsher environmental

conditions are vital in the modern revolutionary agriculture increasing global food production to a rate that can match the ever growing world population (Lopes et al., 2015).

Fighting malnutrition and enhancing global food security is dependent on various research and practices that improve qualitative and quantitative productivity, facilitating the release of crop varieties that are high yielding, highly nutritious, disease/pest resistant and are adapted to the climate condition of a particular geographical location (FAO, 2020). These scientific efforts consist of various works in genetics, breeding, soil improvement and other agronomic practices; their success in improving productivity is sometimes based on genetic variations across varieties within specie (Govindaraj, Vetriventhan, & Srinivasan, 2015). The variations are conventionally introduced through crossing parents with desired traits or via various modern biotechnological procedures, by selecting varieties with desired phenotypic traits through field trails under varying environmental conditions; the selection is based on response of each variety to several factors as observed by their phenotypic traits. Variation opens the door to diversity in plant genetic resources (PGR) which provides opportunity for geneticists and breeders to improve existing cultivars or develop new varieties with characteristic breeder preferred traits such as draught resistance, pest and disease resistance, photosensitivity etc and farmers' desired characters such as early maturing, high yield, seed size and total amount of economically important parts by selecting individuals that stand out with certain traits that can be exploited to enhance more yield to meet the food demand of the growing populations (Govindaraj, Vetriventhan, & Srinivasan, 2015).

Golden melon provides opportunities for genetic improvement through recombination and introgression polymorphism in fruit characteristics exhibited by cultivars as they exist in different forms, shapes and sizes (Shet, Kamagoud, Hongal, & Nishani, 2019). By increasing the

knowledge base of researchers about golden melon cultivars, information about fruit-quality components and interrelationship about them is significant in creating unique varieties with combinations of desired fruit traits (Chen, & Yang, 2010). The goal is to give a quick rundown of operations and efforts to find melon germplasm that excels in one or more fruit-quality components, as well as to explain new combinations and linkages. Fruit quality is mostly assessed by taste, and sugar content, particularly sucrose, is a primary component of taste. Commercially accessible melons, unlike most fruits consumed fresh, lack acidity. Introduction of acidity into sweet melon using exotic melon germplasm, resulted in a unique sweet-sour melon flavor (Cohen, Itkin, and Yeselson, 2014). Nutritive value, notably carotenoids and ascorbic acid, is another aspect of fruit quality (vitamin C). Surveying melon accessions for fruit-quality components and identified several accessions that had consistently high sucrose content as well as high carotenoid and ascorbic acid contents.

In other to evaluate the trait performance of crop varieties under study, various descriptive statistical methods are employed in determining heritability, genetic, phenotypic, environmental variability so as to draw conclusion in determining the frequency of occurrence of certain identical traits in specific varieties across generations (Balkan, 2018). Descriptive statistics also aid in determining the most significant factor in determination of genetic composition of individuals among genetic, phenotypic and environmental variability (Fest, & Besemer, 2018). Knowing the most significant factor assists breeders in selecting cultivars that has higher probability of passing desired characters to succeeding generations. Geneticists and plant breeders often use **heritability** in measuring the precision of trails (Holland, Nyquist, & Cervantes-Martínez, 2003). In quantitative genetics, determination of response to selection is determined by heritability a key parameter. High heritability means that the observed variance is

less influenced by the environment. It also provides an estimate of the genetic progress a breeder can expect from population selection and aids in determining which breeding approach to use. Another significant criterion that aids the breeder in selecting a selection program is genetic progress, which measures the degree of gain in a characteristic gained under a certain selection pressure. For a particular characteristic, high heritability and genetic progress indicate that it is regulated by additive gene activity and hence provides the most effective selection condition.

Path coefficient analysis Correlation knowledge alone can be deceiving because the correlation noticed isn't necessarily accurate (Singh, 2010). Two characters may be correlated simply because they are correlated with a common third character. In such instances, a strategy that takes into consideration the causal relationship between the variables, as well as the degree of that relationship, is required (Kumar, Das, Bishnoi, & Sharma, 2017). Path coefficient analysis separates correlation coefficients into components of direct and indirect effects and quantifies the direct influence of one variable on the other. The division of total correlation into direct and indirect effects provides accurate information on character contribution and hence serves as the foundation for character selection to increase yield.

2.2 Review of methodological approaches

According to a study conducted by Adedapo in 2017 by reviewing a data indicating the effect of climatic factors such as temperature, relative humidity, rainfall and sunshine hours on the yield of the following crops; sweet potato, okra, pepper, tomato and amaranth in rainy and (irrigated)-dry season for a period of ten years, he stated that the high-lighted climatic factors had negligible effect on the production of sweet potato, pepper, amaranth and okra but significant effect was observed in tomato production for the ten year period in Ilorin. Tomato production and yield declined when rain was well established due to optimum humidity and temperature creating an

environmental condition that is most suitable for bacterial and fungal growth; causal organisms of most tomato diseases. However periods of lower relative humidity that is not suited for pathogen growth but optimum for tomato production facilitated good yield in tomato (Adedapo, 2017). This study shows the importance of producing or harvesting some vegetables in dry season, when the relative humidity is low and the incidence of pathogenic attack very low compared to the wet season (Van Der Lans, Snoek, De Boer, & Elings, 2012). The study also indicates that as long as water and appropriate soil condition are met, with proper agronomic practices most crops can be produced in the rainy and dry season ensuring multiple harvests in a farming year.

The success of plant breeding programs is depended on genetic variability in the breeding materials (Hallauer, 2011). Since variability provides the basis for selection, its importance in crop science cannot be over emphasized. During this study, the genetic parameters and mean squares of five genotypes of golden melon planted in the field and screen house, in the raining and dry seasons of the year 2020. The genotypes on the ANOVA table recorded highly significant ($p < 0.01$) variation for most of the studied traits on the field during the rainy season excluding; plant height at two weeks and number of flowers per plant at six weeks that were non-significant, plant height at four weeks, number of flowers per plant at four weeks and number of branches per plant were marginally significant ($p < 0.05$). The other three environmental conditions (i.e screen house in rainy season, screen house and field in dry season) also recorded highly significant variations for most of the studied trait, others traits recorded non-significant variation. The highly significant variation for most of the traits of the genotypes across the four environmental conditions suggests the existence of inherent variability among the genotypes under study. This inherent genetic variability is validated by the study of Fergany,

Kaur, & Monforte, (2011), which reported the existence of genetic variation among landraces of melo (*Cucumis melo* L.). For successful selection and management of yield enhancing programs in any given crop population, genetic variation is very important to facilitate generation of crop genotypes or varieties that are with improved yield and are better adapted, genetic variability is the fundamental requirement of any crop breeding program to develop superior cultivars (Tiwari, Tripathi, Tripathi, Khatri, & Bastola, 2019).

Coefficient of variation is an estimate that compares the extent of variability between the traits within a given crop specie, variety or genotype (Ene, Ogbonna, Agbo, & Chukwudi, 2016). During the rainy season, the field experiment recorded highest coefficient of variation in the following traits; number of flowers per branch, number of flowers per plant, number of fruits per plant, fruit size, fruit weight and the number of seeds. Number of flowers per plant had the highest coefficient of variation in the on-field experiment of the rainy season, followed by the number of fruits per plant trait, number of branch per plant recorded the lowest. The rainy season screen house experiment recorded slightly similar coefficient of variation among the traits; fruit size, fruit weight and number of fruits per plant recorded the highest coefficient of variation while number of branches per plant recorded the lowest. However, during the dry season, the field experiment recorded high coefficient of variation for most of the traits with the vine length, number of branches, number of flowers per branch, number of flowers per plant, fruit size, fruit weight and fruit length all recording high CV% values, fruit weight recorded the highest and the lowest coefficient of variation was recorded for number of fruits per plant. The screen house experiment of the dry season recorded high coefficient of variation in the following; plant height, number of branches per plant, number of flowers per branch, number of flowers per plant, number of fruits per plant, fruit size, fruit weight and fruit length. Number of

branches recorded the highest coefficient of variation while the number of seeds trait recorded the lowest. Number of flowers per plant, fruit size, fruit weight and number of seeds had high coefficient of variation across the four experimental setups meaning that these traits had highest amount of exploitable genetic variability among the characters of the golden melon genotypes under study, these traits have great potential for generation of variation in the characters of genotypes under study for the purpose of crop improvement.

2.3 Nutritional potentials of golden melon

Golden melon is defined by Raji and Orelaja (2014) as a large, bright-yellow melon with a pale green to white inside flesh. The golden melon, botanically known as *Cucumis melo* L. and a member of the Cucurbitaceae (Cucurbit) family, originated in Europe and Africa before spreading to other regions of the world. Golden melon's physical traits are comparable to those of casaba and galia melon, with the exception that its skin is smoother, whereas the others have patterned skin. It stands out for its vivid golden-colored strong skin and delicious, sweet flesh. Golden melon, unlike other types of melons, can have a bland flavor. It is, nonetheless, incredibly refreshing and has a wonderful scent. The skin of the golden melon is smooth and thin, unlike the skin of other melons, which is thick and rough. In terms of nutritional value, golden melon, like other types of melon, has a high nutritional content, which includes the health benefits of Korean melon. Vitamin C, Pantothenic acid, Calcium, Zinc, Iron, Potassium, Vitamin A, and Omega 3 are just a few of the nutrients found in golden melon that are good to our bodies. Vitamin A, a potent antioxidant, is beneficial in preventing DNA damage and combating illnesses. According to Raji and Orelaja's research, golden melon seeds are a good source of protein and crude fiber. The oil content of de-hulled golden melon seeds is around 50%. The fact that golden melon includes omega 3 and omega 6 fatty acids is the most outstanding aspect of its

nutritional profile. These fatty acids are commonly present in animal products like fish, and they are included in the health benefits of meat, poultry, and fish. Among the health advantages are; control cholesterol, improve cardiovascular health; ease digestion; manage weight; hydrate the body; support better sleep quality and reduce blood pressure. Potassium can help control nerves, blood vessels, and muscle contractions, all of which affect blood pressure. The capacity of golden melon to improve mood will also have an impact on our sleeping patterns. We can avoid depression if we are in a good mood. We can also help with some sleep issues, such as insomnia. Golden melon, on the other hand, aids in better sleep and a better day the next morning. Golden melon can be used to prepare nutritious fruit and veggie smoothies to reap the health benefits. Golden melon used to make fruit and veggie smoothies improves the taste of the fruit while also imparting a lovely aroma to the veggies. Many individuals dislike adding vegetables to their smoothies because they make the smoothie smell bad. Golden melon can also be used to make a cocktail by simply peeling the melon, cutting it in half, and scooping out the luscious flesh, combining it with the other fruits and then adding water and syrups to taste. For a golden melon cocktail, pineapple and water melon might be the ideal pairing; these fruits will properly hydrate your body while also improving your performance.

2.3 Gap identified in literature

There are extensive experiments on the agronomic properties, yield and varietal performance of cucumber and water melon in kwara state with limited literatures available on the agronomic traits, yield and varietal performance of genotypes in the *Cucumis melo* L. species.

However, very little work has been carried out on improvement of the golden melon crop. A detailed knowledge of genetic variability and diversity and heritability of various quantitative characters, and their contribution to yield, is essential so as to achieve maximum productivity

any crop improvement program, planning and execution of a breeding programme for the improvement of quantitative attributes depends, to a larger extent, upon the genetic magnitude of genetic variability. The genotypic and phenotypic coefficient variations are significant and are used to investigate the nature of variability in breeding populations, whilst the estimate of heritability is a measure of character transmissibility. Estimating direct selection factors such as coefficient of variation, heritability, and genetic advance can help you come up with a good selection strategy for a higher yielding golden melon. Burton (1952) proposed that combining GCV with heritability estimates would provide the greatest picture of the magnitude of selection's predicted advance. Golden melon is an underutilized vegetable crop, with just a few breeding programs used to take use of the genetic diversity present. As a result, data on the level of diversity, heritability, and genetic progress for eighteen qualitative and quantitative features in eight different muskmelon types was gathered.

CHAPTER THREE

3.0 METHODOLOGY

The seasonal variability study on the phenotypic and the nutritive qualities of some golden melon genotypes was conducted both on field and in screen house at the research farm of Landmark University omu-aran Kwara state Latitude $8^{o}12'$N and $5^{o}08'$ E, during the 2020 rainy (April-July) and dry season (September-December).Pre-planting weather parameters were collected before conducting the experiment. Weather parameters collected at the Landmark Resaerch Farm meterological station were; the total amount of rain, the average temperature and the average relative humility for every month in the year 2020 as shown in Table 1.

Table 1: Weather parameters for the year 2020

Month	Temp Avg (Celsius)	Total Rain (mm)	Rel. Hum. Avg (%)
JAN	28.6	0	36.12
FEB	30.15	0	31.68
MAR	30.32	119.63	75.86
APR	29.56	137.92	81.71
MAY	28.71	163.58	85.77
JUN	28.03	197.61	88.24
JUL	28.82	123.19	90.89
AUG	26.8	21.08	88.81
SEP	26.74	286	90.4
OCT	26.75	157.23	85.95
NOV	28.69	0	63.59
DEC	29.66	0	62.91

Source: Landmark University Research Farm meteorological station.

The soil used for the study was loamy sand, gravelly alfisoil as described by Adegbite et al, (2020). Samples from the field and the soil to be used for the potted screen house experiment were collected for laboratory analysis. The chemical properties of the soil are outlined in Table 2.

Table 2: Chemical properties of the soil sample

Cations	SS value ($cmolkg^{-1}$)	sub-SS value ($cmolkg^{-1}$)
Hydrogen (H^+)	1.72	1.69
Aluminium (Al^{3+})	3.65	4.4
Calcium (Ca^{2+})	1.43	1.85
Magnesium (Mg^{2+})	0.26	0.21
Potassium (K^+)	0.16	0.16
Sodium (Na^+)	0.72	0.9
Phosphorus (P)	18.2	12.7
Organic Carbon	2.06%	3.9%
Nitrogen (N)	0.61%	0.56%

SS: soil sample

3.1 Research design

The experimental design was a Randomized Complete Block Design for five genotypes with three replicates and repeated for both field and screen house experiments.

3.2 Research design layout

V1	**V5**	**V3**
V2	**V3**	**V1**
V3	**V4**	**V5**
V4	**V1**	**V2**
V5	**V2**	**V4**

Where V1- *DAYO*

V2- *OMEGA F1*

V3- *EPSILON F1*

V4- *DELTA F1*

V5- *CARRIBEAN QUEEN F1*

3.3 Agronomic practices

Land preparation: mechanical land preparation was adopted using tractor drawn plough and harrow. After mechanical operations, human labour was employed to partition the site into plots.

The screen house experiment was a potted experiment using perforated black polythene bags filled with the same soil from the field.

Plot Size: the size of each unit was 1m by 1m, with a spacing of 0.5m between plants, giving a total plot size of $28m^2$ (7m by 4m)

Nursery: the seeds of ***Cucumis melo* L.** genotypes were sowed at 1.5cm depth in a nursery bed containing moist loamy soil, at the rate of two seeds per hole.

Transplanting: the seedlings were transplanted at four stands per plot, 15 days after emergence.

Weed control: hand weeding was carried out every 3weeks.

Pest control: insecticide (Zipper G-Force) was applied at weekly interval till 2 weeks after transplanting.

3.4 Research instruments and tools

3.4.1 Tractor drawn plough: the tractor drawn plough was used to open up the compact soil, breaking it down into smaller crumbs. Existing vegetation was also incorporated into the soil at two weeks before experimental field layout. Removal of soil compactness aided aeration, root penetration and water infiltration at optimum rate into the soil. The incorporated vegetation also enhanced soil properties by increasing the amount of organic matter in the soil and improving soil fertility.

3.4.2 Hoe and shovel: were used to divide the measured field into plots as earlier indicated in the experimental design and layout. The tools were also used in the filling up of black polythene bags for the potted experiment with soil from same plot.

3.4.3 Perforated polythene bags: used to hold the soil for the screen house experiment. The bags were perforated to promote water infiltration for healthy roots.

3.4.4 Bamboo and rope trellis: were used to mark the edge of each plot and also supported the climbing veins. The young veins and tendrils were trained by gently wrapping them round the rope trellis to prevent 'inter-crawling'.

3.4.5 Measuring tape: was used to measure the vein length and fruit length in **centimeter.**

3.4.6 Digital and analogue (camry) weighing scale:digital weighing scale was used to weigh the lighter harvested fruits of the 'DAYO' genotype while the analogue scale was used for genotypes with heavier fruits.

3.4.7 Irrigation tubes: rubber tubes were connected to existing irrigation system in the screen house to provide drip irrigation system.

3.4.8 Hand trowel: was used in applying basal dose of fertilizer **(N:P:K 15-10-10)**.

3.4.9 Inputs: inputs used include pre-emergence herbicide (Atrazine at rate of 150ml per 15L knap sack sprayer), pesticide (Zipper G-force at rate of 20ml per 15L knap sack sprayer) and fertilizer (N:P:K 15-10-10 at 15g per plant stand 2WAT). Pre-emergence herbicide was spread on field plot and potted experiment 3-days after sowing/ 4-days before emergence to control weed. Pesticide was applied at three weeks after emergence before flowering to control insect pests such as ladybug *Coccinellaseptum punctata* with characteristic red and black coloration and white fly *Bermisia tabacci*. A basal dose of N:P:K 15-10-10 was applied at two weeks after emergence.

3.5 Equipment used for proximate analysis:

3.5.1 Aluminum dishes: the dishes were used in weighing fruit samples on the weighing balance and in holding the fresh fruit samples inside oven. Before use, the aluminum dishes were washed and dried in oven and cooled down in the desiccators. The weight of the sterile dishes was also taken.

3.5.2 Desiccators: were used in cooling down oven dried tools like the aluminum dishes, spatula, and thimble.

3.5.3 Oven: was used in drying and sterilizing tools like the aluminum dish and platinum crucibles. The oven was also used in drying weighed free samples of the fruit when determining the moisture content.

3.5.4 Platinum crucibles: were used to hold the fruit samples during ashing in the furnace to determine the in-organic components (minerals) of the samples.

3.5.5 Furnace: was used during ashing in a destructive method for decomposition of all organic components.

3.5.6 Digital weighing scale: was used in weighing the fresh samples, oven-dried samples, residual ash and the aluminum dishes.

3.5.7 Thimble and cotton wool: was used in holding fresh fruit samples in the Soxhlet extractor when determining the lipid content.

3.5.8 Soxhlet flask and extractor: were used to extract and determine the amount of lipids in the fresh fruit samples.

3.5.9 Kjeldahl, 500ml flat bottom and conical flask: was used to determine the protein content of the fresh fruit sample.

3.5.10 Fume cupboard: was used for digestion during protein determination.

3.5.11 Cheese cloth, flutter funnel and muffle furnace: were all used during crude fiber extraction.

3.5.12 Chemical reagents:

- 200ml of Petroleum ether (C_6H_{14})
- 10 Tablets of Disodium sulfate decahydrate (Na_2SO_4)
- 1g of Copper (II) sulfate ($CuSO_4$)
- 20ml of concentrated sulfuric acid (H_2SO_4)
- 70ml of 40% Sodium hydroxide (NaOH)
- 50ml of 4% Boric acid (H_3BO_3)
- Methyl red indicator ($C_{15}H_{15}N_3O_2$)
- 0.01M Hydrochloric acid (HCl)
- Diethyl ether $(C_2H_5)_2O$
- 200ml of 1.25% concentrated sulfuric acid (H_2SO_4)
- 200ml of 1.25% sodium hydroxide (NaOH)

3.6 Data collection:

3.6.1 Vein length: was collected at two, four and six weeks after emergence with the aid of a measuring tape and recorded in centimeter.

3.6.2 Number of branches: the branches per plant were counted and recorded on the six week.

3.6.3 Number of flowers per branch: the number of flowers per branch at four and six weeks were counted and recorded.

3.6.4 Number of flowers per plant: the number of flowers per plant at four and six weeks were counted and recorded.

3.6.5 Number of fruits per plant: the number of fruits per plant were counted and recorded during harvest.

3.6.6 Fruit size: the fruit size was calculated using the formula $\boldsymbol{\pi r^2 h}$**;**

h = the length of harvested fruit from top to bottom was marked out on a white paper and measured with a measuring tape and recorded in centimeter.

r = radius was calculated from the diameter by dividing by **2,** the diameter is recorded from the measured transversely cut fruit, also recorded in centimeter.

3.6.7 Fruit weight: fruit weight was measured using the digital and analogue weighing balance for the light weighted and heavier fruits respectively; it was recorded in **kg** (kilogram).

3.6.8 Fruit length: length of fruit was marked out on a white paper and measured with a measuring tape, recorded in centimeter.

3.6.9 Number of seeds: fruits were selected per genotype and the seeds were extracted, counted and recorded.

3.6.10 Moisture content determination: the method used is based on the principle of moisture evaporation whenever heat is applied to a given substance. The aluminum dishes were washed dried in the oven and left to cool in the desiccators. The weight of the sterile aluminum dish was

taken and five grams (5.0 g) of mashed fresh sample was weighed into a sterile aluminum dish, weight of the fresh sample was taken and transferred into an oven set at 80^{o}C for 2 hours and at 105^{o}C for 3 hours. It was removed, cooled down in desiccators and weighed, the sample was returned to the oven for another 1 hour and weighed; the process was repeated till a constant weight was obtained. The difference between the initial weight and the constant weight after oven drying represented the moisture content.

Expressed as: Moisture content (%) = loss in weight {(W2-W3)/(W2-W1)}* 100

Where W1=initial weight of empty dish

W2=weight of dish + fresh sample

W3=final weight of dish + oven-dried sample

% of dry matter = 100-moisture content

3.6.11 Ash content: the ash represents the inorganic (minerals) component of the sample after all moisture and organic materials have been removed. The method is a destructive approach based on the decomposition of all organic matter so that only mineral elements are left in the process. Twenty grams (20g) of each of the samples were weighed into a clean dried and cooled platinum crucible. It was put into a furnace set at 550^{o}C and allowed to blast for 3 hours. It was then brought out and allowed to cool in desiccators and weighed.

Expressed as: Ash content = (weight of ash/weight of fresh sample) * 100

Loss in weight {(W3-W1)/(W2-W1)} * 100

Where W1 = weight of empty crucible

W2 = weight of crucible + fresh sample

W3 = weight of crucible + ash.

3.6.12 Lipid content: The technique used was the Association of Official Analytical Chemists' soxhlet extraction procedure (AOAC, 2010).Fifteen grams (15g) of the samples were weighed and placed in a fat-free thimble with care. To prevent the sample from being lost, it was covered with wool. A loaded thimble was placed in the Soxhlet extractor, and 200ml of petroleum ether was poured into a weighted fat-free soxhlet flask connected to the extractor. The petroleum ether in the flask was refluxed by placing it on a heated mantle. A running tap connected to the extractor was used to cool the solvent for at least 6 hours before it was totally sucked into the flask. The solvent was evaporated using a rotary vacuum evaporator, leaving the extracted lipids in the soxhlet. The flask was removed from the evaporator and dried in a 60°C oven to a consistent weight. The flask was then weighed after cooling in desiccators. Each determination was made three times. By calculating the difference, the amount of fat taken was computed. Ether extracts (100g) dry matter = (weight of extracted lipid/weight of dry sample) * 100

3.6.13 Protein determination: Total protein was determined by the Kjedahl method. The analysis of a compound for its protein content by Kjedahl method is based upon the determination of the amount of reduced nitrogen present. About twenty grams (20g) of the samples were weighed onto filter paper and placed into a Kjedahl flask, where 10 tablets of Na_2SO_4 and 1g of $CuSO_4$ were added. Twenty (20) milliliters of concentrated H_2SO_4 was added, and the solution was digested in a fume cupboard until it was colorless. It was allowed to cool overnight before being transferred to a 500 mL flat bottom flask containing 200 mL water. After that, ice packs were used to chill it down. 50 ml of 4 percent boric acid and 3 drops of screened

methyl red indicator, added to 70 ml of 40% NaOH were put into the conical flask that served as the receiver. After that, the ammonia gas was distilled into the receiver until it completely evaporated. The receiver was titrated with 0.01M HCl until the solution became colorless.

Expressed as: Protein content = Vs – Vb * 0.01401* N acid (6.25) * 100 * wt of fresh sample

Where Vs = Volume (ml) of acid required to titrate sample,

Vb = Volume (ml) of acid required to titrate blank

N acid = normality of acid.

3.6.14 Crude fiber: the bulk of roughages in food is referred to as fiber and estimated as crude fiber. Golden melon fresh samples (20g) were defatted for 8 hours with diethyl ether and then boiled for exactly 30 minutes with 200ml of H_2SO_4 under reflux. On a flutter funnel, it was then filtered through cheese cloth. The acid was then totally removed by washing it with boiling water. After that, the residue was heated for 30 minutes in a round bottomed flask with 200ml of 1.25 percent NaOH before being filtered through a previously weighed couch crucible. The crucible was then dried with samples in a 100°C oven, cooled in desiccators, and weighed later. This was then cremated at 600°C for 2 hours in a muffle furnace, and then allowed to cool in desiccators before being weighed.

Expressed as: %fiber = C2 – C3 * 100/ Wt of fresh sample.

3.6.15 Carbohydrate determination: %carbohydrate = 100 – (protein% + moisture% + ash% + fiber% + fat %).

3.6.16 Caloric value (Kj/100g) = (protein * 16.7) + (lipids * 37.7) + (Carbohydrate * 16.7)

3.7 Data analysis technique/software: descriptive and variability analysis was carried out to calculate the following:

3.7.1 Effect of season and genotype on characters: the effects of season, genotype and interaction between season and genotype on characters were subjected to analysis of variance using SPSS statistical package.

3.7.2 Trait mean performance: the significant trait means were graded using Duncan multiple range test with GenStat statistical package and the genotypes with the highest performing traits were indicated by grading the highest performing traits with alphabet 'a' and other letters as value reduces.

3.6.3 Genetic variability: genetic variability is expressed as genotypic co-efficient of variation and was calculated using the formula;

$$GCV=\frac{\sqrt{\sigma_g^2}}{X} \times 100$$

$\{ \sigma^2_g = (MSg–MSe) /r\}$

Where MSg = genotype mean of square, MSe = error mean of square and r = replicate

3.6.4 Phenotypic variability: expressed as Phenotypic Co-efficient of Variation and calculated using the formula;

$$PCV = \frac{\sqrt{\sigma_p^2}}{X} \times 100$$

$\{ \sigma^2_p = \sigma^2_g + \sigma^2_e\}$

Where σ^2_p = phenotypic variance, σ^2_e / MSe = error mean of square and σ^2_g = genotypic variance.

3.6.5 Environmental variability: expressed as Environmental Co-efficient of Variation using the formula;

$$ECV = \frac{\sqrt{\sigma_e^2}}{X} \times 100$$

3.6.6 Heritability: the degree of variation in a phenotypic trait in a population that is due to genetic variation between individuals in that population was expressed as;

$$\mathbf{H^2_{bs}\%} = \sigma^2_g / \sigma^2_p \times 100$$

CHAPTER FOUR

4.0 RESULTS AND DISCUSSION

4.1 RESULTS

Figure 2: Golden melon genotypes in the nursery and at one week after transplanting

Figure 3: Golden melon genotypes at four and six weeks after transplanting

Figure 4: Golden melon genotypes at harvest

4.1.1 Genotype and season effects on vine length of golden melon:

Table 3 shows that differences in vine length of golden melon genotypes due to seasonal variation at the field experiment was significant at 4 and 6 weeks after transplanting but not significant at 2 weeks after transplanting. The early season recorded the longest vine length at 21.84cm, 79.43cm and 158.90cm at 2, 4 and 6 WAT respectively. There was also significant difference in vine length of golden melon genotypes due to varietal effect in the field experiment at 2, 4 and 6 WAT. Caribbean queen (V5) genotype recorded the longest vine length at 32.13cm, 59.78cm and 100.50cm at 2, 4 and 6 WAT respectively while Omega F1 (V2) recorded the shortest vine length. The interaction between season and genotype was significant in the field experiment at 2, 4 and 6 WAT.

Difference in vine length of golden melon genotypes due to seasonal variation at the screen house experiment was significant at 2 and 6 WAT but not significant at 4 WAT. Early season recorded the longest vine length at 32.78cm, 42.65cm and 139.92cm at 2, 4 and 6 WAT respectively. There was also significant difference in vine length of golden melon genotypes due to varietal effect in the screen house experiment at 2 and 6 WAT but not significant at 4 WAT. Epsilon F1 (V3) recorded the longest vine length (33.11cm) at 2 WAT, Delta F1 recorded longest vine length at 4 WAT (48.33cm) and 6 WAT (121.61cm). Interaction between season and genotype was also significant in the screen house experiment at 2 WAT but not significant at 4 and 6 WAT.

Table 3: ***Genotype and season effect on vine length of golden melon***

	Field			Screen house		
Season (S)	Vine length at 2WAT (cm)	Vine length at 4WAT (cm)	Vine length at 6WAT (cm)	Vine length at 2WAT (cm)	Vine length at 4WAT (cm)	Vine length at 6WAT (cm)
Early	21.84a	79.43a	158.90a	32.78a	42.65a	139.92a
Late	20.20a	32.55b	49.20b	22.35b	38.71a	81.43b
Genotype (G)						
V1	18.49bc	47.22bc	83.50b	28.91ab	43.33ab	116.43a
V2	15.54c	39.79d	76.61b	20.08c	29.96b	91.34bc
V3	20.41b	43.25cd	80.50b	33.11a	42.78ab	102.43ab
V4	17.16bc	50.84b	87.72b	26.29bc	48.33a	121.61a
V5	32.13a	59.78a	100.50a	20.73c	35.72ab	72.82c
P						
S	0.397	0.000	0.000	0.000	0.648	0.000
G	0.000	0.000	0.001	0.001	0.052	0.001
S × G	0.000	0.000	0.000	0.008	0.309	0.931

VI: DAYO F1, V2:OMEGA F1, V3: EPSILON F1, V4: DELTA F1, V5: CARRIBEAN QUEEN F1; p is the probability of F statistic from ANOVA; means in column for each effect followed by similar letter are not significantly different at p = 0.05 according to Duncan's multiple range test.

4.1.2a Genotype and season effects on number of branches:

Table 4 shows genotype and season effects on number of branches, flowers per branch at 4 WAT and flowers per plant branch at 6 WAT recorded that differences observed in number of branches of golden melon genotypes due to seasonal variation at the field experiment was significant; the early season recorded the highest number of branches at 4.07 while the late season recorded the lowest at 2.53. There was also significant difference in number of golden melon genotypes due to varietal variation at the field experiment; Delta F1 (V4) recorded most branches at 4.11 while Omega F1 (V2) recorded the least branches at 2.33. There was no significant interaction between season and genotype in the field experiment for the number of branches.

Table 4 also shows that differences in number of golden melon genotypes branches due to seasonal variation at the screen house experiment was significant; the early season recorded most branches at 3.80 while late season recorded the lowest at 1.67. There was significant difference in number of golden melon genotypes branches due to varietal variation at the screen house experiment; Caribbean queen F1 (V5) recorded most branches at 3.44 while Omega F1 (V2) recorded the least branches at 1.78. As presented in Table 2 significant interaction was recorded between season and genotype in the screen house experiment for number of branches character.

4.1.2b Genotype and season effects on number of flowers per branch:

Table 4 shows the genotype and season effects on number of flowers per branch the differences in number of flowers per branch of golden melon genotypes due to seasonal variation in the field experiment was not significant at 4 weeks after transplanting but significant at 6 weeks after transplanting. The early season recorded most flowers per branch at 6 WAT (5.67) while late season recorded fewest flowers per branch at 6 WAT (3.07). There was also significant

difference in number of flowers per branch of golden melon genotypes due to varietal variation in the field experiment at 4 and 6 WAT; Omega F1 (V2) recorded the highest number of flowers per branch at 4 WAT (3.11) and 6 WAT (5.89) while Delta F1 (V4) recorded fewest flowers per branch at 4 WAT (1.44) and 6 WAT (2.67). There was no significant interaction between season and genotype in the field experiment for the number of flowers per branch character at 4 and 6 WAT.

Table 4 also indicated; differences in number of flowers per branch of golden melon genotypes due to seasonal variation in the screen house experiment was not significant at 4 WAT but significant at 6 WAT; the early season recorded most flowers per branch at 6 WAT (7.80) while late season recorded fewest flowers per branch at 6 WAT (4.53). There was significant difference in number of flowers per branch of golden melon genotypes due to varietal variation in the screen house experiment at 6 WAT but not at 4 WAT; Delta F1 (V4) recorded most flowers per branch at 6 WAT (6.44) while Caribbean queen F1 (V5) recorded the fewest flowers per branch. There was significant interaction between season and genotype in the screen house experiment for the number of flowers per branch character at 6 WAT, but the interaction was not significant at 4 WAT.

Table 4: ***Genotype and season effects on number of branches, flowers per branch at 4 WAT and flowers per plant branch at 6 WAT.***

	Field			Screen house		
Season (S)	No of branches	No of flowers/ branch at 4WAT	No of flowers/ branch at 6WAT	No of branches	No of flowers/ branch at 4WAT	No of flowers/ branch at 6WAT
Early	4.07a	2.53a	5.67a	3.80a	3.27a	7.80a
Late	2.53b	2.20a	3.07b	1.67b	3.13a	4.53b
Genotype (G)						
V1	3.00b	2.11ab	3.00b	2.11bc	3.78a	6.00a
V2	2.33b	3.11a	5.89a	1.78c	3.11ab	6.00a
V3	2.56b	2.33ab	4.00b	2.11bc	3.11ab	6.11a
V4	4.11a	1.44b	2.67b	2.44b	3.56ab	6.44a
V5	3.22ab	2.56a	4.11b	3.44a	2.33b	3.56b
P						
S	0.000	0.611	0.000	0.000	0.943	0.000
G	0.013	0.033	0.001	0.000	0.150	0.015
S × G	0.450	0.730	0.174	0.000	0.354	0.046

VI: DAYO F1, V2:OMEGA F1, V3: EPSILON F1, V4: DELTA F1, V5: CARRIBEAN QUEEN F1; p is the probability of F statistic from ANOVA; means in column for each effect followed by similar letter are not significantly different at p = 0.05 according to Duncan's multiple range test.

4.1.3a Genotype and season effects on number of flowers per plant:

As presented in table 5 Genotype and seasonal effects number of fruits per plant, flowers per plant at 4 WAT and flowers per plant at 6 WAT, differences in number of flowers per plant of golden melon genotypes due to seasonal variation in the field experiment was significant at 4 and 6 weeks after transplanting; early season recorded most flowers per plant at 4 WAT (8.80) and at 6 WAT (11.20) while late season recorded fewest flowers per plant at 4 WAT (3.53) and at 6 WAT (5.20). There was also significant difference in number of flowers per plant of golden melon genotypes due to varietal variation in the field experiment at 4 WAT but not significantly different at 6 WAT; Omega F1 (V2) recorded most flowers per plant at 4 WAT (6.89) while DAYO (V1) recorded the fewest flowers per plant at 4 WAT (3.33). Interaction between season and genotype in the field experiment for the number of flowers per plant character was significant at 4WAT but not at 6 WAT.

Table 5 also indicated; differences in number of flowers per plant of golden melon genotypes due to seasonal variation in the screen house experiment was significant at 4 and 6 WAT; early season recorded most flowers per plant at 4 WAT (18.13) and 6 WAT (18.87) while late season recorded fewest flowers per plant at 4 WAT (4.40) and 6 WAT (6.33). There was significant difference in number of flowers per plant of golden melon genotypes due to varietal variation in the screen house experiment at 4 and 6 WAT; Epsilon F1 (V3) recorded most flowers per plant at 4 WAT (10.33), Delta F1 (V4) recorded most flowers per plant at 6 WAT (12.22) while DAYO recorded fewest flowers per plant at both 4 WAT (7.67) and 6 WAT (9.44). The interaction between season and genotype in the screen house experiment was significant for the number of flowers per plant character at both 4 and 6 WAT.

4.1.3b Genotype and season effects on the number of fruits per plant:

Table 5 Genotype and seasonal effects number of fruits per plant, flowers per plant at 4 WAT and flowers per plant at 6 WAT showed that, differences in the number of fruits per plant of golden melon genotypes due to seasonal variation in the field experiment was significant; early season recorded highest number of fruits per plant at 8.20 while the late season recorded fewest fruits per plant at 1.20. There was significant difference in number of fruits per golden melon plant due to varietal variation in the field experiment; DAYO (V1) recorded most fruits per plant at 5.44 while Epsilon F1 (V3) and Caribbean queen F1 (V5) both recorded fewest fruits per plant at 2.78. Interaction between season and genotype in the field experiment was significant for the number of fruits per plant character.

Differences in the number of fruits of golden melon genotypes per plant due to seasonal variation in the screen house experiment was also significant; early season recorded most fruits per plant at 3.40 while late season recorded fewest fruits per plant at 1.40. There was significant difference in number of golden melon fruits due to varietal variation in the screen house experiment; DAYO (V1) recorded most fruits per plant at 3.22 while Epsilon F1 (V3) recorded fewest fruits per plant of golden melon genotypes at 1.67. Interaction between season and genotype was significant in the screen house experiment for the number of fruits per plant character.

Table 5: ***Genotype and seasonal effects on number of fruits per plant, flowers per plant at 4 WAT and flowers per plant at 6 WAT***

	Field			Screen house		
Season (S)	No of flowers/ plant at 4WAT	No of flowers / plant at 6WAT	No of fruits/ plant	No of flowers/ plant at 4WAT	No of flowers / plant at 6WAT	No of fruits/ plant
Early	8.80a	11.20a	8.20a	18.13a	18.87a	3.40a
Late	3.53b	5.20b	1.20b	4.40b	6.33b	1.40b
Genotype (G)						
V1	3.33c	6.78a	5.44a	7.67c	9.44b	3.22a
V2	6.89a	7.78a	3.22b	9.00abc	9.56b	1.89b
V3	5.11abc	6.22a	2.78b	10.33a	11.89a	1.67b
V4	5.00bc	7.11a	3.44b	9.67ab	12.22a	1.78b
V5	6.11ab	8.11a	2.78b	8.22bc	9.44b	1.78b
P						
S	0.000	0.000	0.000	0.000	0.000	0.000
G	0.003	0.520	0.000	0.005	0.013	0.000
S × G	0.000	0.183	0.000	0.000	0.000	0.001

VI: DAYO F1, V2:OMEGA F1, V3: EPSILON F1, V4: DELTA F1, V5: CARRIBEAN QUEEN F1; p is the probability of F statistic from ANOVA; means in column for each effect followed by similar letter are not significantly different at p = 0.05 according to Duncan's multiple range test.

4.1.4a Genotype and season effects on the fruit size of golden melon genotypes:

Genotype and season effects on fruit size, weight and length of golden melon genotypes showed that, difference in the fruit size of golden melon genotypes due to seasonal variation in the field experiment was significant; early season recorded the largest fruit size at 120.67 cm^3 while late season recorded the smallest at 108.82 cm^3, (Table 6). There was also significant difference in fruit size of golden melon genotypes due to varietal variation in the field experiment; Epsilon F1 (V3) recorded the largest fruit size at 152.58 cm^3 while DAYO (V1) recorded the smallest fruit size at 48.33 cm^3. There was no significant interaction between season and genotype in the field experiment for the fruit size character of golden melon genotypes.

As presented in Table 6, there was significant difference in the fruit size of golden melon genotypes due to seasonal variability in the screen house experiment; early season recorded the largest fruit size at 122.71 cm^3 while late season recorded the smallest at 121.08 cm^3. There was significant difference in the fruit size of golden melon genotypes due to varietal variation in the screen house experiment; Epsilon F1 (V3) recorded the largest fruit size at 122.71 cm^3 while DAYO (V1) recorded the smallest fruit size at 51.42 cm^3. There was no significant interaction between season and genotype in the screen house experiment for the fruit size character of golden melon genotypes.

4.1.4b Genotype and season effects on fruit weight per golden melon plant:

Genotype and season effects on fruit size, weight and length of golden melon genotypes indicated that, difference in the fruit weight per golden melon plant due to seasonal variation in the field experiment was significant; early season recorded the heaviest fruit weight at 8.71 kg while late season recorded the lightest fruit weight per plant at 1.39 kg, (Table 6). There was also

significant difference in the fruit weight of golden melon genotypes due to varietal variation in the field experiment; Epsilon F1 (V3) recorded the heaviest fruit weight per plant at 6.03 kg while DAYO (V1) recorded the lightest fruit weight at 2.03 kg. Interaction between season and genotype in the field experiment for the fruit weight per golden melon plant character was significant.

As presented in Table 6, there was significant difference in fruit weight per golden melon plant due to seasonal variability in the screen house experiment; early season recorded the heaviest fruit weight per plant at 3.43 kg while late season recorded the lightest fruit weight at 1.72 kg. There was significant difference in fruit weight per golden melon plant due to varietal variation in the screen house experiment; Epsilon F1 (V3) recorded the heaviest fruit weight per plant at 3.11 kg while DAYO (V1) recorded the lightest fruit weight at 1.21 kg. There was significant interaction between season and genotype in the screen house experiment for the fruit weight per golden melon plant character.

4.1.4c Genotype and season effects on length of golden melon fruit:

Genotype and season effects on fruit size, weight and length of golden melon genotypes indicated that, difference in fruit length of golden melon genotypes due to seasonal variation in the field experiment was significant; early season recorded the longest fruit at 15.73 cm while late season recorded the shortest golden melon fruit at 14.49 cm, (Table 6). There was also significant difference in the fruit length of golden melon genotypes due to varietal variation in the field experiment; Epsilon F1 (V3) recorded the longest fruit at 22.08 cm while DAYO (V1) recorded the shortest golden melon fruit at 11.08cm. Interaction between season and genotype was not significant in the field experiment for the length of golden melon fruit character.

As presented in Table 6, there was no significant difference in fruit length of golden melon genotypes due to seasonal variability in the screen house experiment; early season recorded 15.87 cm while late season recorded 15.36 cm. There was significant difference in fruit length of golden melon genotypes due to varietal variation in the screen house experiment; Epsilon F1 (V3) recorded the longest fruit at 21.82 cm while DAYO (V1) recorded the shortest golden melon fruit length at 12.60 cm. Interaction between season and genotype was not significant in the screen house experiment for the length of golden melon fruit character.

Table 6: ***Genotype and season effects on fruit size, weight and length of golden melon genotypes***

	Field			Screen house		
Season (S)	Fruit size (cm^3)	Fruit weight (kg)	Fruit length (cm)	Fruit size (cm^3)	Fruit weight (kg)	Fruit length (cm)
Early	120.67a	8.71a	15.73a	122.71a	3.43a	15.87a
Late	108.82b	1.39b	14.49b	121.08b	1.72b	15.36a
Genotype (G)						
V1	48.33e	2.03c	11.08c	51.42e	1.21c	12.60d
V2	100.45d	3.98b	13.56b	114.33d	2.20b	13.93c
V3	152.58a	6.03a	22.08a	167.24a	3.11a	21.82a
V4	122.72c	3.72b	13.62b	133.75c	2.52ab	14.26bc
V5	139.84b	3.39b	14.18b	141.38b	2.39ab	15.03b
P						
S	0.001	0.000	0.001	0.018	0.000	0.233
G	0.000	0.000	0.000	0.000	0.001	0.000
S × G	0.466	0.000	0.996	0.948	0.007	0.999

VI: DAYO F1, V2:OMEGA F1, V3: EPSILON F1, V4: DELTA F1, V5: CARRIBEAN QUEEN F1; p is the probability of F statistic from ANOVA; means in column for each effect followed by similar letter are not significantly different at p = 0.05 according to Duncan's multiple range test.

4.1.5a Genotype and effects on number of seeds per golden melon fruit:

Table 7 Genotype and season effects on moisture content, ash content and number of seeds per fruit showed that, there was no significant difference in the number of seeds per golden melon fruit due to seasonal variation in both the field and screen house experiments. However, there was significant difference in the number of seeds per golden melon fruit due to varietal variation in the field experiment; Epsilon F1 (V3) recorded the highest number of seeds per fruit at 701.2 while Delta F1 (V4) recorded fewest seeds per golden melon fruit at 337.4. There was no significant interaction between the season and genotype in field experiment for the number of seeds per golden melon fruit character.

Difference in the number of seeds per golden melon fruit due to varietal variation in the screen house experiment was also significant; Epsilon F1 (V3) recorded the highest number of seeds per fruit at 688.3 while Delta F1 (V4) recorded fewest seeds per golden melon fruit at 338.7. There was no significant interaction between the season and genotype in the screen house experiment for number of seeds per golden melon fruit character.

4.1.5b Genotype and season effects on percentage of moisture in golden melon fruit samples:

As presented in table 7 Genotype and season effects on moisture content, ash content and number of seeds per fruit, there was no significant difference in percentage of moisture in golden melon fruits due to seasonal variation in both field and screen house experiments. There was significant difference in percentage of moisture in golden melon fruit due to varietal variation in the field experiment; Delta F1 (V4) recorded the highest moisture percentage in golden melon fruit at 80.09 % while DAYO (V1) had the lowest fruit moisture percentage at 60.50 %. The

interaction between season and genotype was not significant in the field experiment for the percentage of moisture in golden melon fruit character.

There was also significant difference in golden melon fruit moisture percentage due to varietal variation in the screen house experiment; Caribbean queen F1 (V5) recorded highest moisture percentage at 91.01 % while DAYO (V1) recorded the lowest fruit moisture percentage at 75.20 %. There was significant interaction between season and genotype in the screen house experiment for the percentage of moisture in golden melon fruit character.

4.1.5c Genotype and season effects on percentage of ash in golden melon fruit samples:

Genotype and season effects on moisture content, ash content and number of seeds per fruit indicated that, there was no significant difference in ash percentage of golden melon fruit samples due to seasonal variation in both the field and screen house experiments. However, there was significant difference in ash percentage of fruit samples due to varietal variation in the field experiment; Delta F1 (V4) had most ash content at 0.83 % while V3 recorded the least ash percentage in fruit samples at 0.24 %. Interaction between season and genotype was not significant in the field experiment for the percentage of ash in golden melon fruit character.

Difference in ash percentage of golden melon fruit samples due to varietal variation in the screen house experiment was also significant; Delta F1 (V4) recorded the highest ash percentage at 12.21 % while Caribbean queen F1 (V5) recorded the lowest ash percentage at 1.98 %. Interaction between season and genotype was not significant in the screen house experiment for the percentage of ash in golden melon fruit character.

Table 7: ***Genotype and season effects on moisture content, ash content and number of seeds per fruit***

	Field			Screen house		
Season (S)	No of seeds	Moisture (%)	Ash (%)	No of seeds	Moisture (%)	Ash (%)
Early	487.7a	72.03a	0.414a	485.7a	84.01a	5.83a
Late	483.7a	71.44a	0.437a	476.7a	82.73a	5.87a
Genotype (G)						
V1	509.3b	60.50c	0.462b	516.8b	75.20d	6.82b
V2	420.2d	68.80b	0.333c	415.3c	80.75c	5.18c
V3	701.2a	71.52b	0.240c	688.3a	81.73c	3.09d
V4	337.4e	80.09a	0.830a	338.7d	87.07b	12.21a
V5	457.0c	77.27a	0.280c	438.7c	91.01a	1.98e
P						
S	0.936	0.939	0.854	0.570	0.100	0.993
G	0.000	0.000	0.000	0.000	0.000	0.000
S × G	0.997	0.108	0.991	0.991	0.002	0.998

VI: DAYO F1, V2:OMEGA F1, V3: EPSILON F1, V4: DELTA F1, V5: CARRIBEAN QUEEN F1; p is the probability of F statistic from ANOVA; means in column for each effect followed by similar letter are not significantly different at p = 0.05 according to Duncan's multiple range test.

4.1.6a Genotype and season effects on carbohydrate percentage in golden melon fruit samples: Table 8 Genotype and season effects on caloric value, carbohydrate and fibre content in golden melon fruit samples showed that, there was no significant difference in carbohydrate percentage of golden melon fruit samples due to seasonal variation in both the field and screen house experiments. However, there was significant difference in percentage of carbohydrate in golden melon fruit samples due to varietal variation in the field experiment; Epsilon F1 (V3) recorded the highest carbohydrate percentage in fruit sample at 28.03 % while Delta F1 (V4) had the lowest percentage at 18.71 %. There was no significant interaction between season and genotype in the field experiment for the percentage of carbohydrate in golden melon fruit character.

There was also significant difference in carbohydrate percentage in golden melon fruit samples due to varietal variation in the screen house experiment; Epsilon F1 (V3) recorded the highest carbohydrate percentage in fruit sample at 13.73 % while Delta F1 (V4) had the lowest percentage at 6.11 %. There was no significant interaction between season and genotype in the screen house experiment for the percentage of carbohydrate in golden melon fruit character.

4.1.6b Genotype and season effects on the caloric value of golden melon fruit samples:

As presented in Table 8 Genotype and season effects on caloric value, carbohydrate and fibre content in golden melon fruit samples, there was no significant difference the caloric value of golden melon fruit samples due to seasonal variation in both the field and screen house experiments. However, there was significant difference in caloric value of golden melon fruit samples due to varietal variation in the field experiment; Omega F1 (V2) recorded the caloric value of fruit sample at 490 kj/100g while Delta F1 (V4) had the smallest caloric value at 331.2

kj/100g. There was no significant interaction between season and genotype in the field experiment for the caloric value of golden melon fruit character.

There was also significant difference in the caloric value of golden melon fruit samples due to varietal variation in the screen house experiment; Epsilon F1 (V3) recorded the highest caloric value in golden melon fruit sample at 242.7 kj/100g while Delta F1 (V4) had the smallest caloric value at 136.4 kj/100g. There was no significant interaction between season and genotype in the screen house experiment for the caloric value of golden melon fruit character.

4.1.6c Genotype and season effects on percentage of fibre in golden melon fruit samples:

Genotype and season effects on caloric value, carbohydrate and fibre content in golden melon fruit samples showed that, there was no significant difference in percentage of fibre in golden melon fruit samples due to seasonal variation in both the field and screen house experiments, (Table 8). However, there was significant difference in percentage of fibre in golden melon fruit samples due to varietal variation in the field experiment; DAYO (V1) recorded the highest fibre percentage in fruit sample at 2.67 % while Caribbean queen F1 (V5) had the lowest percentage at 1.11 %. There was no significant interaction between season and genotype in the field experiment for the percentage of fibre in golden melon fruit character.

There was also significant difference in fibre percentage in golden melon fruit samples due to varietal variation in the screen house experiment; Delta F1 (V4) recorded the highest fibre percentage in fruit sample at 1.18 % while Caribbean queen F1 (V5) had the lowest percentage at 0.4 %. There was no significant interaction between season and genotype in the screen house experiment for the percentage of fibre in golden melon fruit character.

Table 8: ***Genotype and season effects on caloric value, carbohydrate and fibre content in golden melon fruit samples***

	Field			Screen house		
Season (S)	Carbohydrate (%)	Calorie (kj/100g)	Fibre (%)	Carbohydrate (%)	Calorie (kj/100g)	Fibre (%)
Early	23.87a	424.4a	1.91a	9.56a	186.2a	0.794a
Late	23.47a	417.8a	2.02a	9.73a	193.4a	0.800a
Genotype (G)						
V1	25.06c	435.1b	2.67a	10.18b	200.7b	0.771b
V2	25.90b	490a	1.38c	10.42b	224.8a	0.570c
V3	28.03a	487.7a	2.44ab	13.73a	242.7a	1.07a
V4	18.71e	331.2d	2.32b	6.11d	136.4c	1.18a
V5	20.32d	356.1c	1.11d	8.08c	150.3c	0.404d
P						
S	0.227	0.440	0.368	0.938	0.559	0.994
G	0.000	0.000	0.000	0.000	0.000	0.000
S × G	0.701	0.071	0.433	1.000	0.771	1.000

VI: DAYO F1, V2:OMEGA F1, V3: EPSILON F1, V4: DELTA F1, V5: CARRIBEAN QUEEN F1; p is the probability of F statistic from ANOVA; means in column for each effect followed by similar letter are not significantly different at p = 0.05 according to Duncan's multiple range test.

4.1.7a Genotype and season effects on percentage of lipids in golden melon fruit samples:

As presented in Table 9, genotype and season effects on carotene, lipids and protein percentage in golden melon fruit samples, there was no significant difference in percentage of lipids in golden melon fruit samples due to seasonal variation in both the field and screen house experiments. However, there was significant difference in percentage of lipids in golden melon fruit samples due to varietal variation in the field experiment; Omega F1 (V2) recorded the highest lipids percentage in fruit sample at 0.363 % while DAYO (V1) had the lowest percentage at 0.047 %. There was no significant interaction between season and genotype in the field experiment for the percentage of lipids in golden melon fruit character.

There was also significant difference in lipids percentage of golden melon fruit samples due to varietal variation in the screen house experiment; Omega F1 (V2) recorded the highest percentage of lipids in fruit sample at 1.36 % while DAYO (V1) had the lowest percentage at 0.37 %. There was no significant interaction between season and genotype in the screen house experiment for the percentage of lipids in golden melon fruit character.

4.1.7b Genotype and season effects on percentage of protein in golden melon fruit samples:

Table 9 shows the genotype and season effects on carotene, lipids and protein percentage in golden melon fruit. There was no significant difference in percentage of protein in golden melon fruit samples due to seasonal variation in both the field and screen house experiments. However, there was significant difference in percentage of protein in golden melon fruit samples due to varietal variation in the field experiment; DAYO (V1) recorded the highest protein percentage in fruit sample at 2.67 % while Caribbean queen F1 (V5) had the lowest percentage at 1.11 %.

There was no significant interaction between season and genotype in the field experiment for the percentage of protein in golden melon fruit character.

There was also significant difference in protein percentage in golden melon fruit samples due to varietal variation in the screen house experiment; Delta F1 (V4) recorded the highest percentage of protein in fruit sample at 1.18 % while Caribbean queen F1 (V5) had the lowest percentage at 0.4 %. There was no significant interaction between season and genotype in the screen house experiment for the percentage of protein in golden melon fruit character.

4.1.7c Genotype and season effects on beta carotene content of golden melon fruit samples:

Table 9 Genotype and season effects on carotene, lipids and protein percentage in golden melon fruit samples showed that, there was no significant difference in beta carotene content of golden melon fruit samples due to seasonal variation in both the field and screen house experiments, (Table 9). However, there was significant difference in the amount of beta carotene in golden melon fruit samples due to varietal variation in the field experiment; DAYO (V1) recorded the highest amount of beta carotene in fruit sample at 0.1 mg/100g while Epsilon (V3) and Caribbean queen F1 (V5) both had the lowest beta carotene at 0.07 mg/100g. There was no significant interaction between season and genotype in the field experiment for the beta carotene content in golden melon fruit character.

There was also significant difference in amount of beta carotene in golden melon fruit samples due to varietal variation in the screen house experiment; Delta F1 (V4) recorded the highest beta carotene in fruit sample at 0.053 mg/100g while Epsilon (V3) had the lowest beta carotene content at 0.017 mg/100g. There was no significant interaction between season and genotype in the screen house experiment for the beta carotene content in golden melon fruit character.

Table 9: ***Genotype and season effects on carotene, lipids and protein percentage in golden melon fruit samples***

	Field			Screen house		
Season (S)	Lipids (%)	Protein (%)	Carotene (mg/100g)	Lipids (%)	Protein (%)	Carotene (mg/100g)
Early	0.143a	1.22a	0.827a	0.741a	0.731a	0.033a
Late	0.128a	1.22a	0.827a	0.745a	0.727a	0.034a
Genotype (G)						
V1	0.047c	1.75a	0.100a	0.373b	0.830a	0.052a
V2	0.363a	1.74b	0.080c	1.36a	0.797a	0.023b
V3	0.056bc	0.873c	0.070d	0.527b	0.634c	0.017d
V4	0.137b	0.870c	0.093b	0.784b	0.706b	0.053a
V5	0.063bc	0.870c	0.070d	0.676b	0.676b	0.023b
P						
S	0.851	1.000	1.000	1.000	0.979	0.984
G	0.000	0.000	0.000	0.002	0.000	0.000
S × G	0.992	0.994	1.000	1.000	1.000	1.000

VI: DAYO F1, V2:OMEGA F1, V3: EPSILON F1, V4: DELTA F1, V5: CARRIBEAN QUEEN F1; p is the probability of F statistic from ANOVA; means in column for each effect followed by similar letter are not significantly different at p = 0.05 according to Duncan's multiple range test.

4.1.8a Genotype and season effects on Vitamin A content of golden melon fruit samples:

Table 10 shows the genotype and season effects on the Vitamin A, Vitamin C and Calcium content in golden melon fruit. There was no significant difference in Vitamin A content of golden melon fruit samples due to seasonal variation in both the field and screen house experiments. However, there was significant difference in the amount of Vitamin A in golden melon fruit samples due to varietal variation in the field experiment; DAYO (V1) recorded the highest amount of Vitamin A in fruit sample at 4.9 mg/100g while Caribbean queen F1 (V5) had the lowest Vitamin A content at 3.43 mg/100g. There was no significant interaction between season and genotype in the field experiment for the Vitamin A content in golden melon fruit character.

There was also significant difference in amount of Vitamin A in golden melon fruit samples due to varietal variation in the screen house experiment; DAYO (V1) recorded the highest Vitamin A in fruit sample at 2.73 mg/100g while Caribbean queen F1 (V5) had the lowest Vitamin A content at 1.22 mg/100g. There was no significant interaction between season and genotype in the screen house experiment for the Vitamin A content in golden melon fruit character.

4.1.8b Genotype and season effects on Vitamin C content of golden melon fruit samples:

Genotype and season effects on the Vitamin A, Vitamin C and Calcium content in golden melon fruit samples showed that, there was no significant difference in Vitamin C content of golden melon fruit samples due to seasonal variation in both the field and screen house experiments, (Table 10). However, there was significant difference in the amount of Vitamin C in golden melon fruit samples due to varietal variation in the field experiment; Epsilon (V3) recorded the highest amount of Vitamin C in fruit sample at 14.38 mg/100g while Delta F1 (V4) had the

lowest Vitamin C content at 9.33 mg/100g. There was no significant interaction between season and genotype in the field experiment for the Vitamin C content in golden melon fruit character.

There was also significant difference in amount of Vitamin C in golden melon fruit samples due to varietal variation in the screen house experiment; Caribbean queen F1 (V5) recorded the highest Vitamin C in fruit sample at 23.10 mg/100g while Delta F1 (V4) had the lowest Vitamin C content at 11.88 mg/100g. There was no significant interaction between season and genotype in the screen house experiment for the Vitamin C content in golden melon fruit character.

4.1.8c Genotype and season effects on Calcium content of golden melon fruit samples:

Table 10 Genotype and season effects on the Vitamin A, Vitamin C and Calcium content in golden melon fruit samples showed that, there was no significant difference in the calcium content of golden melon fruit samples due to seasonal variation in the field. However, there was significant difference in the amount of calcium in golden melon fruit samples due to varietal variation in the field experiment; Caribbean queen F1 (V5) recorded the highest amount of calcium in fruit sample at 0.462 ppm while Delta F1 (V4) had the lowest calcium content at 0.222 ppm. There was no significant interaction between season and genotype in the field experiment for the Calcium content in golden melon fruit character.

There was also significant difference in amount of calcium in golden melon fruit samples due to seasonal variation in the screen house experiment; late season recorded highest amount of calcium at 1.43 ppm while early season recorded lowest calcium content at 1.03 ppm. Difference in amount if calcium in fruit sample due to varietal variation in the screen house experiment; Omega F1 (V2) recorded the highest calcium in fruit sample at 2.17 ppm while Delta (V4) had

the lowest calcium content at 0.793 ppm. There was significant interaction between season and genotype in the screen house experiment for the Calcium content in golden melon fruit character.

Table 10: ***Genotype and season effects on the Vitamin A, Vitamin C and Calcium content in golden melon fruit samples***

	Field			Screen house		
Season (S)	Vitamin A (mg/100g)	Vitamin C (mg/100g)	Calcium (ppm)	Vitamin A (mg/100g)	Vitamin C (mg/100g)	Calcium (ppm)
Early	4.13a	11.04a	0.349a	2.09a	16.79a	1.03b
Late	4.13a	10.90a	0.353a	2.09a	17.71a	1.43a
Genotype (G)						
V1	4.90a	7.66e	0.373b	2.73a	13.92b	1.06c
V2	4.00c	11.02c	0.240c	2.17c	15.71b	2.17a
V3	3.70d	14.38a	0.459a	1.81d	22.39a	1.37b
V4	4.62b	9.33d	0.222d	2.52b	11.88c	0.793d
V5	3.43e	12.33b	0.462a	1.22e	23.10a	1.11c
P						
S	0.820	0.242	0.732	0.999	0.354	0.000
G	0.000	0.000	0.000	0.000	0.000	0.000
S × G	0.989	0.184	0.954	1.000	0.435	0.000

VI: DAYO F1, V2:OMEGA F1, V3: EPSILON F1, V4: DELTA F1, V5: CARRIBEAN QUEEN F1; p is the probability of F statistic from ANOVA; means in column for each effect followed by similar letter are not significantly different at p = 0.05 according to Duncan's multiple range test

4.1.9 Beta carotene content in golden melon genotypes across growing environments:

As presented in Figure 1, DAYO (V1) and Delta F1 (V4) genotypes from the early season field experiments had the highest amount of β carotene across all growing environment at 0.1 mg/100g while Omega F1 (V2) and Epsilon F1 (V3) from the early season screen house experiments had lowest β carotene content at 0.02 mg/100g. in the late season experiments, Epsilon F1(V3), Delta F1 (V4) and Caribbean queen F1(V5) from the field experiment had highest β carotene content at 0.09 mg/100g while Epsilon F1(V3) from the screen house had the lowest at 0.03 mg/100g.

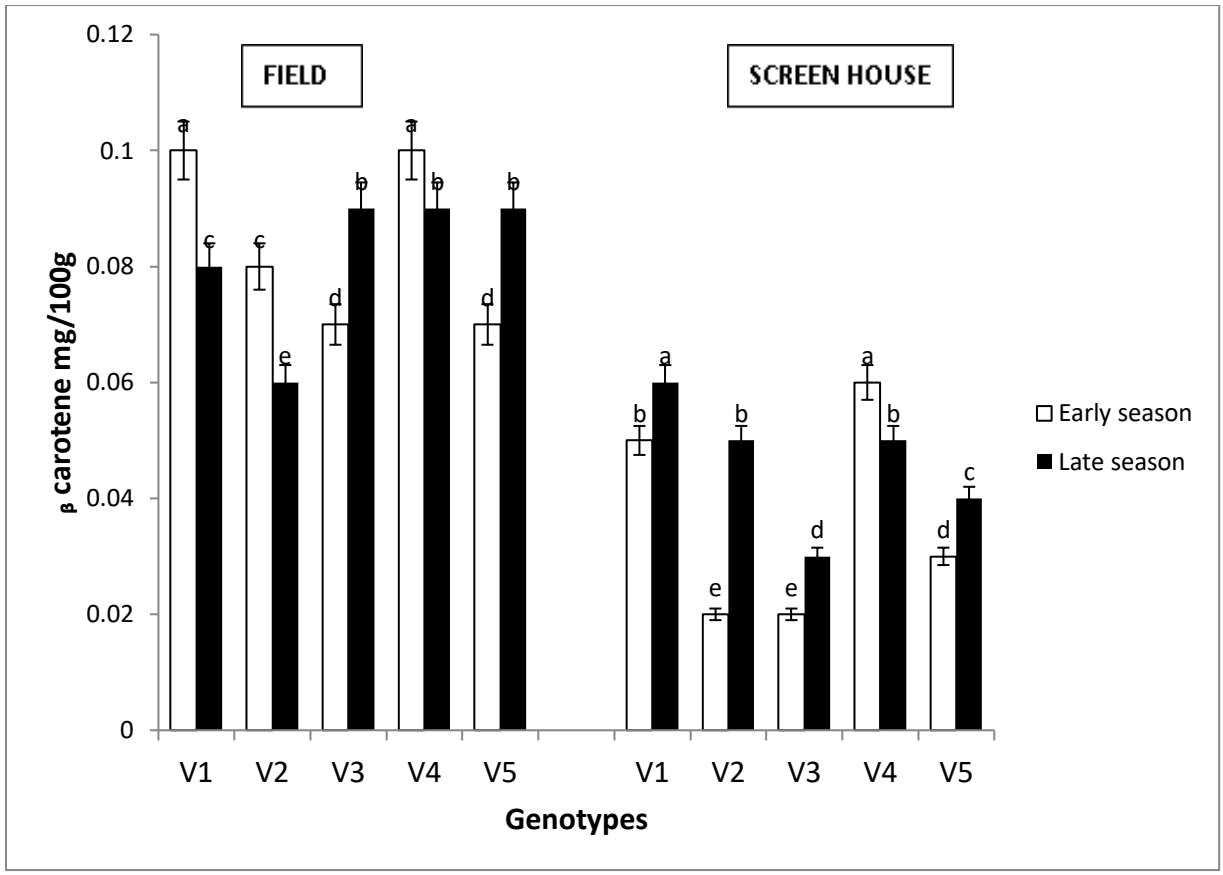

Figure 5: Beta carotene content in golden melon genotypes across growing environments.

Note: *VI: DAYO F1, V2:OMEGA F1, V3: EPSILON F1, V4: DELTA F1, V5: CARRIBEAN QUEEN F1; Vertical bars show standard errors of paired comparisons; bars marked with different letters show means significantly different at 5% level according to Duncan's multiple range test.*

4.1.10 Vitamin A content in golden melon genotypes across growing environments:

Figure 2 showed that, DAYO (V1) genotype from the late season field experiment had highest amount of vitamin A at 5.54 mg/100g while Caribbean queen F1 (V5) from late season screen house experiment recorded the lowest amount at 1.14 mg/100g across all growing environment.

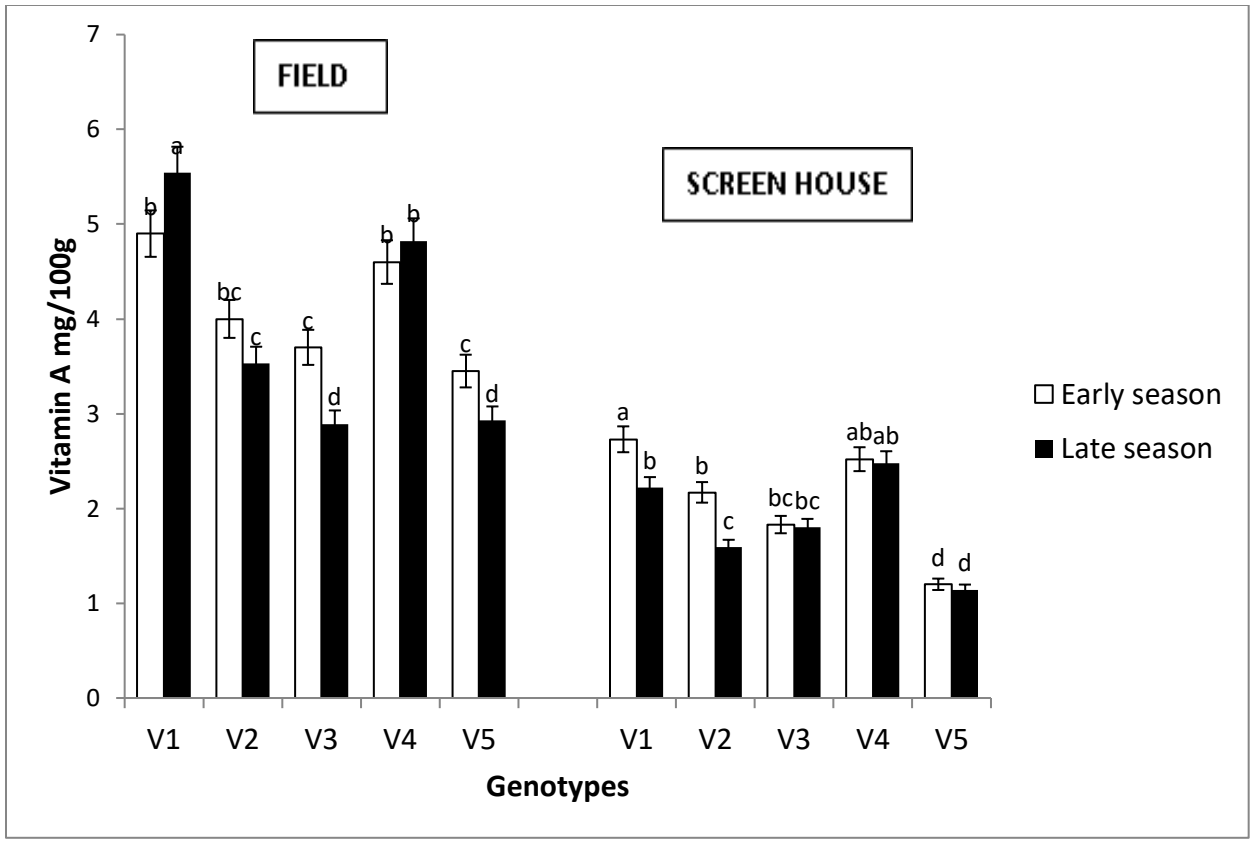

Figure 6: Vitamin A content in golden melon genotypes across growing environments.

Note: *VI: DAYO F1, V2:OMEGA F1, V3: EPSILON F1, V4: DELTA F1, V5: CARRIBEAN QUEEN F1; Vertical bars show standard errors of paired comparisons; bars marked with different letters show means significantly different at 5% level according to Duncan's multiple range test.*

4.1.11 Vitamin C content in golden melon genotypes across growing environments:

As presented in figure 3, DAYO (V1) genotype from the late season field experiment had highest amount of Vitamin C at 27.42 mg/100g while DAYO (V1) genotype from the early season field experiment had lowest Vitamin C content at 8.15 mg/100g across all growing environments. In the early season experiments, Epsilon F1 (V3) genotype from the screen house experiment had highest Vitamin C content at 22.39 mg/100g.

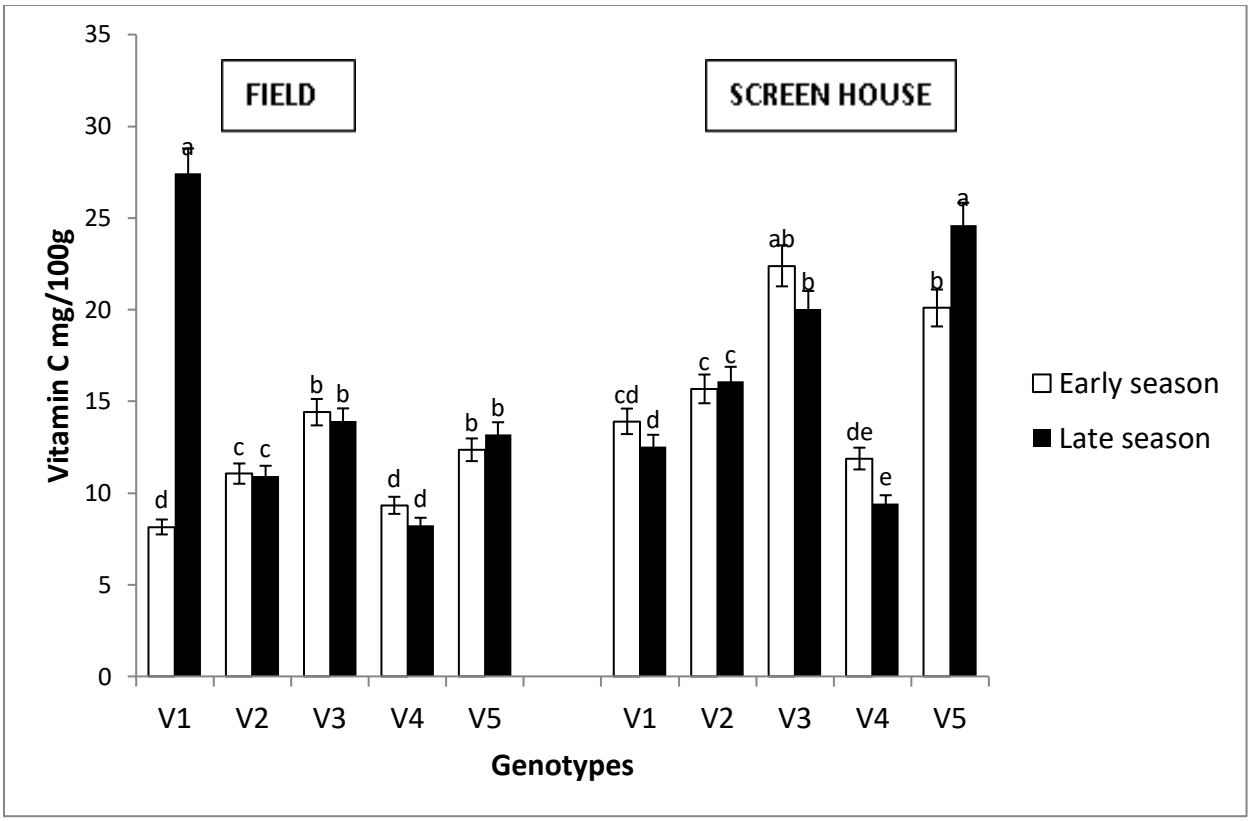

Figure 7: Vitamin C content in golden melon genotype across growing environments.

Note: *VI: DAYO F1, V2:OMEGA F1, V3: EPSILON F1, V4: DELTA F1, V5: CARRIBEAN QUEEN F1; Vertical bars show standard errors of paired comparisons; bars marked with different letters show means significantly different at 5% level according to Duncan's multiple range test.*

4.1.12 Calcium content in golden melon genotypes across growing environments:

Figure 4 shows that, Omega F1 (V2) genotype from the late season screen house experiment had the highest amount of calcium at 2.88 ppm while Delta F1 (V4) from the early season field experiment recorded lowest calcium amount at 0.22 ppm across all growing environments. Epsilon F1 (V3) from the screen house had highest calcium amount in the early season experiments.

4.1.13 Mean performance of vegetative and phenotypic traits of golden melon genotypes in the early season

Table 11 shows that in the early season field experiment, Omega F1 (V2) and Epsilon (V3) recorded the high mean performances for the vine length trait 6WAT at 187.17cm and 166.17cm. With the mean at 158.90cm, DAYO F1 (V1), Delta F1 (V4) and Caribbean Queen F1 (V5) all had low performances for the vine length trait at 135.17cm, 149.83cm and 156.17cm. In the early season screen house experiment, DAYO F1 (V1), Omega F1 (V2) and Delta F1 (V4) high mean performances for vine length trait 6WAT at 156.83cm, 145.17cm and 150.43cm. Epsilon F1 (V3) and Caribbean Queen F1 (V5) had low mean performances at 138.17cm and 109.00cm. in the early season field experiment, DAYO F1 (V1), Omega F1 (V2) and Delta F1 (V4) recorded high mean performances for the number of branches trait at 4.33 branches. However Epsilon F1 (V3) and Caribbean queen F1 (V5) had low mean performance at 3.67 branches. In the screen house experiment, DAYO F1 (V1) and Delta F1 (V4) recorded high man performances at 4.33 and 4.00 branches respectively while Omega F1 (V2), Epsilon F1 (V3) and Caribbean queen F1 (V5) recorded low mean performances at 3.33, 3.67 and 3.67 respectively. In the early season field experiment, Omega F1 (V2) and Epsilon F1 (V3) recorded high mean performances in the number of flowers per branch at 6WAT trait at 7.67 and 7.33 flowers per branch. DAYO F1

(V1), Delta F1 (V4) and Caribbean queen F1 (V5) had low mean performances. However, Omega F1 (V2), Epsilon F1 (V3) and Delta F1 (V4) recorded high mean performances for the number of flowers per branch trait in the screen house experiment at 10.00, 9.67 and 8.00 flowers per branch respectively. In the early season field experiment, DAYO F1 (V1) and Delta F1 (V4) both recorded high mean performances for the number of fruits per plant trait at 13.67 and 8.33 fruits per plant respectively. In the screen house experiment, Omega F1 (V2), Epsilon F1 (V3) and Caribbean queen F1 (V5) all had low mean performances for the number of fruits per plant trait. Omega F1 (V2), Epsilon F1 (V3) and Delta F1 (V4) had high mean performances for the fruit weight per plant trait in the early season field experiment at 9.43kg, 12.53kg and 8.90kg. DAYO F1(V1) and Caribbean queen F1 (V5) had low mean performances for the fruit weight per plant stand trait. Omega F1 (V2) and Delta F1 (V4) had high mean performances for the fruit weight per plant trait in the screen house experiment at 3.90kg and 5.10kg respectively. DAYO F1 (V1), Epsilon F1 (V3) and Caribbean queen F1 (V5) all recorded low mean performances for the fruit weight per plant trait. For the number of seeds per fruit trait, DAYO F1 (V1) and Epsilon F1 (V3) had high mean performances in the early season field and screen house experiments at (506.67 & 513.67) and (714.33 & 702.33) respectively. Omega F1 (V2), Delta F1 (V4) and Caribbean queen F1 (V5) had low mean performances.

Table 12 shows that in the late season field experiment, DAYO F1 (V1), Delta F1 (V4) and Caribbean queen F1 (V5) recorded high mean performances for the vine length trait 6WAT at 57.67cm, 56.67cm and 72.67cm. With the mean at 49.20cm, Omega F1 (V2) and Epsilon F1 (V3) all had low performances for the vine length trait at 21.33cm and 37.67cm. In the early season screen house experiment, DAYO F1 (V1), Epsilon F1 (V3) and Delta F1 (V4) high mean performances for vine length trait 6WAT at 96.23cm, 84.57cm and 107.20cm. Omega F1 (V2)

and Caribbean queen F1 (V5) had low mean performances at 64.43cm and 54.73cm. in the early season field experiment, Delta F1 (V4) and Caribbean queen F1 (V5) recorded high mean performances for the number of branches trait at 4.00 and 3.00 branches respectively. DAYO F1 (V1), Omega F1 (V2) and Epsilon F1 (V3) had low mean performances for the number of branches trait. In the screen house experiment, Delta F1 (V4) and Caribbean queen F1 (V5) recorded high man performances at 1.67 and 3.33 branches respectively while DAYO F1 (V1), Omega F1 (V2) and Epsilon F1 (V3) recorded low mean performances. In the early season field experiment, Omega F1 (V2) and Caribbean queen F1 (V5) recorded high mean performances in the number of flowers per branch at 6WAT trait at 5.00 and 4.00 flowers per branch respectively. DAYO F1 (V1), Epsilon F1 (V3) and Delta F1 (V4) had low mean performances. However, DAYO F1 (V1) and Delta F1 (V4) recorded high mean performances for the number of flowers per branch trait in the screen house experiment at 6.33 and 5.67 flowers per branch respectively. In the early season field experiment, DAYO F1 (V1), Epsilon F1 (V3) and Caribbean queen F1 (V5) recorded high mean performances for the number of fruits per plant trait at 1.33 fruits per plant. In the screen house experiment, DAYO F1 (V1) and Caribbean queen F1 (V5) had high mean performances for the number of fruits per plant trait at 2.00 and 1.67 respectively. Epsilon F1 (V3) had high mean performances for the fruit weight per plant trait in the early season field experiment at 2.78kg. DAYO F1 (V1), Omega F1 (V2), Delta F1 (V4) and Caribbean queen F1 (V5) had low mean performances for the fruit weight per plant stand trait. Epsilon F1 (V3) and Caribbean queen F1 (V5) had high mean performances for the fruit weight per plant trait in the screen house experiment at 2.98kg and 2.26kg respectively. DAYO F1 (V1), Omega F1 (V2) and Delta F1 (V4) all recorded low mean performances for the fruit weight per plant trait. For the number of seeds per fruit trait, DAYO F1 (V1) and Epsilon F1 (V3) had high mean

performances in the early season field and screen house experiments at (510.67 & 518.33) and (694.67 & 681.33) respectively. Omega F1 (V2), Delta F1 (V4) and Caribbean queen F1 (V5) had low mean performances.

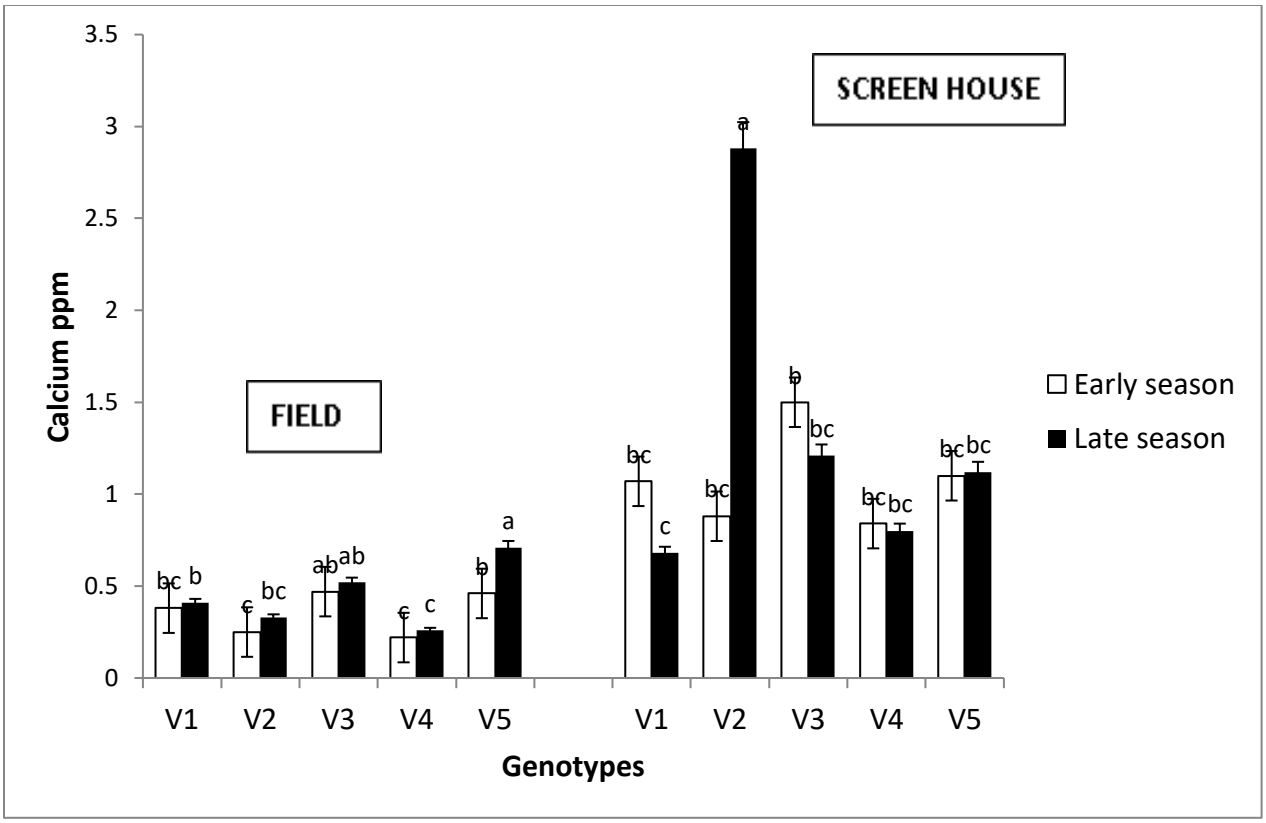

Figure 8: Calcium content in golden melon genotypes across growing environments.

Note: *VI: DAYO F1, V2:OMEGA F1, V3: EPSILON F1, V4: DELTA F1, V5: CARRIBEAN QUEEN F1; Vertical bars show standard errors of paired comparisons; bars marked with different letters show means significantly different at 5% level according to Duncan's multiple range test.*

Table 11: ***Golden melon mean trait performance in the early season***

Traits		V1	V2	V3	V4	V5	S.E	%CV	Mean
VL6	**F**	135.17f	187.17a	166.17bc	149.83ef	156.17ef	11.24	8.70	158.90
	SH	156.83a	145.17a	138.17bc	150.43a	109.00c	13.48	11.80	139.90
NBr	**F**	4.33a	4.33a	3.67b	4.33a	3.67b	0.26	7.80	4.07
	SH	4.33a	3.33a	3.67b	4.00a	3.67b	0.44	14.00	3.80
NFB6	**F**	3.67c	7.67a	7.33a	5.33b	4.33c	0.32	6.80	5.67
	SH	5.33b	10.00a	9.67a	8.00a	6.00b	0.84	13.20	7.80
NFP6	**F**	11.67a	10.67a	12.00a	12.67a	9.00a	3.13	34.20	11.20
	SH	15.67d	20.67ab	25.00a	18.00cd	15.00d	1.98	12.80	18.87
NFrP	**F**	13.67a	7.67b	5.67b	8.33b	5.67b	1.19	17.70	8.20
	SH	5.67a	3.67b	2.33ef	3.33cd	2.00f	0.51	18.20	3.40
FrS(cm^3)	**F**	50.70e	113.58d	165.24a	132.79c	141.06b	0.33	0.30	120.70
	SH	51.61e	115.53d	169.52a	135.18c	142.12b	1.33	1.30	122.71
FrW(kg)	**F**	5.10c	9.43b	12.53a	8.90b	4.60c	0.49	6.90	8.71
	SH	2.10c	3.90bc	3.37bc	5.10a	2.67c	0.90	32.20	3.43
FrL(cm)	**F**	11.90e	14.13d	22.70a	14.67cd	15.27b	0.19	1.50	15.73
	SH	12.73f	14.13e	22.27a	14.57cd	15.63b	0.51	3.90	15.87
NoSD	**F**	506.67b	423.33d	714.33a	329.67e	464.33cd	33.30	8.40	487.70
	SH	513.67a	418.00b	702.33a	341.33c	453.33b	22.87	5.80	485.70

V1:DAYO; V2:OmegaF1; V3:EpsilonF1; V4:DeltaF1; V5:Caribbean queenF1; S.E:standard error at 0.05; %CV:percent coefficient of variation; F:field; SH:screen house; VL6:vine length at 6 WAT; NBr:number of branches; NFB6:number of flowers per branch at 6 WAT; NFrP:number of fruits per plant; FrS:fruit size; FrW:fruit weight; FrL:fruit length; NoSD:number of seeds

Table 12: ***Golden melon mean trait performance in the late season***

Traits		V1	V2	V3	V4	V5	S.E	%CV	Mean
VL6	**F**	57.67bc	21.33e	37.67d	56.67c	72.67a	6.51	16.20	49.20
	SH	96.23d	64.43d	84.57d	107.20c	54.73d	21.40	32.20	81.40
NBr	**F**	2.33bc	1.33c	2.00bc	4.00a	3.00bc	0.89	43.20	2.53
	SH	1.00c	1.00c	1.33c	1.67c	3.33a	0.39	29.00	1.67
NFB6	**F**	2.67bc	5.00a	2.33bc	1.33c	4.00b	1.35	53.90	3.07
	SH	6.33a	4.00a	4.33a	5.67a	2.33a	1.65	44.50	4.53
NFP6	**F**	4.33ab	6.33a	3.33b	4.33ab	7.67a	1.78	34.80	5.20
	SH	6.33ab	4.00b	5.33b	9.33a	6.67ab	1.46	28.30	6.33
NFrP	**F**	1.33a	1.00a	1.33a	1.00a	1.33a	0.41	41.70	1.20
	SH	2.00a	1.00a	1.33a	1.00a	1.67a	0.42	36.90	1.40
FrS(cm^3)	**F**	47.15b	93.88b	146.17a	117.67b	139.22a	8.61	9.70	108.80
	SH	51.33e	133.72d	166.30a	133.30c	141.01b	1.53	1.50	121.08
FrW(kg)	**F**	0.50b	1.26b	2.78a	1.12b	1.29b	0.47	41.20	1.39
	SH	0.76d	1.35cd	2.98a	1.66cd	2.26ab	0.46	32.70	1.71
FrL(cm)	**F**	10.67c	13.27b	21.77a	13.10b	13.63b	0.80	6.80	14.49
	SH	12.53b	13.83b	21.60a	14.10b	14.73b	0.91	7.30	15.36
NoSD	**F**	510.67b	418.67d	694.67a	341.33e	453.33cd	25.10	6.40	483.70
	SH	518.33b	414.00c	681.33a	337.33d	431.33c	25.09	6.40	476.50

V1:DAYO; V2:OmegaF1; V3:EpsilonF1; V4:DeltaF1; V5:Caribbean queenF1; S.E:standard error at 0.05; %CV:percent coefficient of variation; F:field; SH:screen house; VL6:vine length at 6 WAT; NBr:number of branches; NFB6:number of flowers per branch at 6 WAT; NFrP:number of fruits per plant; FrS:fruit size; FrW:fruit weight; FrL:fruit length; NoSD:number of seeds

4.2 Broad sense Heritability, Genetic, Phenotypic and Environment Co-efficient of variation for selected traits of golden melon

4.2.1 Genetic parameters for selected traits in golden melon genotypes for the early season - field experiment: As presented in **Table 13** Genetic parameters for some traits in the golden melon genotypes in the early season- field experiment, percentage co-efficient of variation for selected traits in the early season- field experiment ranged from number of branches trait which had the lowest co-efficient of variation at 15.55% to number of fruits per plant trait which had the highest co-efficient of variation at 69.27%.

The vine length and number of branches vegetative traits recorded higher genotypic coefficient of variation than their corresponding environmental coefficient of variation at 11.14 and 7.78 respectively. The broad sense heritability estimates for the plant height and number of branches traits was also moderate at 69.32% and 50%.

The number of flowers per branch at 6 WAT, number of fruits per plant, fruit weight and number of seeds per fruit reproductive traits recorded higher genotypic coefficient of variation than their corresponding environmental coefficient of variation at 31.14, 38.66, 30.89 and 28.83 respectively. The broad sense heritability for these traits was high at 95.41%, 82.60%, 95.22% and 92.26% respectively.

The carbohydrate, crude protein, beta carotene, vitamin A, vitamin C and calcium content nutritive traits also recorded higher genotypic coefficient of variation than their corresponding environmental coefficient of variation at 17.14, 39.16, 16.38, 14.84, 22.31 and 33.52 respectively. The broad sense heritability for these traits was high at 98.14%, 99.98%, 96.49%, 99.82%, 99.98% and 98.90% respectively.

Table 13: ***Genetic parameters for some traits in the golden melon genotypes in the early season-field experiment***

Traits		%CV	GCV	PCV	ECV	H^2_{bs}(%)
Veg.						
traits	**VL6W**	21.14	11.14	14.11	8.66	62.32
	NoBH	15.55	7.78	11.00	7.78	50.00
Rep.						
trait	**NFB6**	54.36	31.14	31.88	6.83	95.41
	NFP6	34.23	15.12	26.74	22.05	31.97
	NFrP	69.27	38.66	42.54	17.74	82.60
	FrW	53.95	30.89	31.66	6.92	95.22
	NoSD	50.63	28.83	30.01	8.35	92.26
Nut.						
Traits	**CHO%**	29.77	17.14	17.30	2.36	98.14
	CP%	67.83	39.16	39.16	0.50	99.98
	β car	28.54	16.38	16.67	3.12	96.49
	Vit A	25.71	14.84	14.85	0.63	99.82
	Vit C	38.64	22.31	22.31	0.35	99.98
	Ca	58.16	33.52	33.70	3.53	98.90

VL6W:vine length at 6 WAT; NoBH:number of branches; NFB6:number of flowers per branch at 6 WAT; NFP6:number of flowers per plant at 6 WAT; NFrP:number of fruits per plant; FrW:fruit weight per plot; NoSD:number of seeds per fruit; CHO%:percentage of carbohydrate; CP%:percentage of crude protein; βcar:beta carotene; Vit A:vitamin A content; Vit C:vitamin C content; Ca:calcium content; %CV:coefficient of variation; GCV:genotypic coefficient of variation; PCV:phenotypic coefficient of variation; ECV:environmental coefficient of variation; H^2_{bs}(%):broad sense heritability; Veg.:vegetative; Rep.:reproductive; Nut.:nutritive

4.2.2 Genetic parameters for selected traits in golden melon genotypes for the early season - screen house experiment: As presented in **Table 14** Genetic parameters for some traits in the golden melon genotypes in the early season- screen house experiment, percentage co-efficient of variation for selected traits in the early season- screen house experiment ranged from number of branches trait which had the lowest co-efficient of variation at 17.32% to beta carotene content in fruit trait which had the highest co-efficient of variation at 88.41%.

The vine length and number of branches vegetative traits recorded lower genotypic coefficient of variation than their corresponding environmental coefficient of variation. The broad sense heritability estimates for the plant height and number of branches traits was also moderate at 48.33% and 15%.

The number of flowers per branch at 6 WAT, number of flowers per plant at 6 WAT, number of fruits per plant and number of seeds per fruit reproductive traits recorded higher genotypic coefficient of variation than their corresponding environmental coefficient of variation at 25.85, 20.35, 41.07 and 27.84 respectively. The broad sense heritability for these traits was high at 79.22%, 71.60%, 83.57% and 95.89% respectively.

The carbohydrate, crude protein, beta carotene, vitamin A, vitamin C and calcium content nutritive traits also recorded higher genotypic coefficient of variation than their corresponding environmental coefficient of variation at 29.97, 10.27, 47.64, 28.80, 25.85 and 22.03 respectively. The broad sense heritability for these traits was high at 96.03%, 80.26%, 69.26%, 96.82%, 97.92% and 90.55% respectively.

Table 14: ***Genetic parameters for some traits in the golden melon genotypes in the early season-screen house experiment***

Traits		%CV	GCV	PCV	ECV	H^2_{bs}(%)
Veg.						
traits	**VL6W**	23.02	11.41	16.42	11.80	48.33
	NoBH	17.32	5.88	15.19	14.01	15.00
Rep.						
trait	**NFB6**	46.70	25.85	29.05	13.24	79.22
	NFP6	37.51	20.35	24.05	12.82	71.60
	NFrP	73.43	41.07	44.93	18.21	83.57
	FrW	58.48	28.22	42.76	32.12	43.55
	NoSD	48.56	27.84	28.43	5.77	95.89
Nut.						
Traits	**CHO%**	52.23	29.95	30.56	6.09	96.03
	CP%	19.01	10.27	12.26	6.68	70.26
	β car	88.41	47.64	57.24	31.74	69.26
	Vit A	50.16	28.80	29.27	5.22	96.82
	Vit C	44.94	25.85	26.13	3.77	97.92
	Ca	38.82	22.03	23.15	7.12	90.55

VL6W:vine length at 6 WAT; NoBH:number of branches; NFB6:number of flowers per branch at 6 WAT; NFP6:number of flowers per plant at 6 WAT; NFrP:number of fruits per plant; FrW:fruit weight per plot; NoSD:number of seeds per fruit; CHO%:percentage of carbohydrate; CP%:percentage of crude protein; βcar:beta carotene; Vit A:vitamin A content; Vit C:vitamin C content; Ca:calcium content; %CV:coefficient of variation; GCV:genotypic coefficient of variation; PCV:phenotypic coefficient of variation; ECV:environmental coefficient of variation; H^2_{bs}(%):broad sense heritability; Veg.:vegetative; Rep.:reproductive; Nut.:nutritive

4.2.3 Genetic parameters for selected traits in golden melon genotypes for the late season - field experiment: As presented in **Table 15** Genetic parameters for some traits in the golden melon genotypes in the late season- field experiment, percentage co-efficient of variation for selected traits in the late season- field experiment ranged from Vitamin A content in golden melon fruit trait which had the lowest co-efficient of variation at 25.95% to fruit weight per plot trait which had the highest co-efficient of variation at 94.81%.

Vine length recorded a higher genotypic coefficient of variation than its corresponding environmental coefficient of variation at 39.40, the broad sense heritability for vine length was also high at 85.53%. The number of branches parameter had a lower genotypic coefficient of variation than its corresponding environmental coefficient of variation, the broad sense heritability for number of branches trait was low at 34.55%.

The fruit weight per plot and number of seeds per fruit reproductive traits recorded higher genotypic coefficient of variation than their corresponding environmental coefficient of variation at 55.64 and 27.23. The broad sense heritability for these traits was high at 64.61% and 94.83% respectively.

The carbohydrate, crude protein, beta carotene, vitamin A, vitamin C and calcium content nutritive traits also recorded higher genotypic coefficient of variation than their corresponding environmental coefficient of variation at 16.63, 39.16, 16.38, 14.97, 24.56, and 32.47 respectively. The broad sense heritability for these traits was high at 96.25%, 99.98%, 96.49%, 99.61%, 99.05% and 97.97% respectively.

Table 15 ***Genetic parameters for some traits in the golden melon genotypes in the late season-field experiment***

Traits		%CV	GCV	PCV	ECV	H^2_{bs}(%)
Veg.						
traits	**VL6W**	70.14	39.40	42.60	16.21	85.53
	NoBH	69.59	31.46	53.52	43.30	34.55
Rep.						
trait	**NFB6**	81.32	35.18	64.32	53.85	29.92
	NFP6	58.54	27.20	44.13	34.76	37.97
	NFrP	41.67	18.63	32.27	26.35	33.33
	FrW	94.81	55.64	69.22	41.18	64.61
	NoSD	47.59	27.23	27.96	6.36	94.83
Nut.						
Traits	**CHO%**	28.44	16.32	16.63	3.22	96.25
	CP%	67.83	39.16	39.16	0.50	99.98
	β car	28.54	16.38	16.67	3.12	96.49
	Vit A	25.95	14.97	15.00	0.94	99.61
	Vit C	42.61	24.56	24.68	2.41	99.05
	Ca	56.43	32.47	32.80	4.67	97.97

VL6W:vine length at 6 WAT; NoBH:number of branches; NFB6:number of flowers per branch at 6 WAT; NFP6:number of flowers per plant at 6 WAT; NFrP:number of fruits per plant; FrW:fruit weight per plot; NoSD:number of seeds per fruit; CHO%:percentage of carbohydrate; CP%:percentage of crude protein; βcar:beta carotene; Vit A:vitamin A content; Vit C:vitamin C content; Ca:calcium content; %CV:coefficient of variation; GCV:genotypic coefficient of variation; PCV:phenotypic coefficient of variation; ECV:environmental coefficient of variation; H^2_{bs}(%):broad sense heritability; Veg.:vegetative; Rep.:reproductive; Nut.:nutritive

4.2.2 Genetic parameters for selected traits in golden melon genotypes for the late season - screen house experiment: As presented in **Table 16** Genetic parameters for some traits in the golden melon genotypes in the late season- screen house experiment, percentage co-efficient of variation for selected traits in the late season- screen house experiment ranged from the crude protein percentage trait which had the lowest co-efficient of variation at 19.90% to the number of branches trait which had the highest co-efficient of variation at 98.79%.

Number of branches recorded a higher genotypic coefficient of variation than its corresponding environmental coefficient of variation at 55.75, the broad sense heritability for vine length was also high at 78.79%. The vine length trait had a lower genotypic coefficient of variation than its corresponding environmental coefficient of variation, the broad sense heritability for number of branches trait was low at 26.26%.

The fruit weight per plot and number of seeds per fruit reproductive traits recorded higher genotypic coefficient of variation than their corresponding environmental coefficient of variation at 48.65 and 27.31. The broad sense heritability for these traits was high at 68.73% and 94.72% respectively.

The carbohydrate, crude protein, beta carotene, vitamin A, vitamin C and calcium content nutritive traits also recorded higher genotypic coefficient of variation than their corresponding environmental coefficient of variation at 28.86, 11.01, 49.51, 28.54, 31.32, and 56.36 respectively. The broad sense heritability for these traits was high at 96.72%, 79%, 72.64%, 97.19%, 86.75% and 99.23% respectively.

Table 16 ***Genetic parameters for some traits in the golden melon genotypes in the late season-screen house experiment***

Traits		%CV	GCV	PCV	ECV	H^2_{bs}(%)
Veg.						
traits	**VL6W**	46.31	19.22	37.50	32.20	26.26
	NoBH	98.79	55.75	62.80	28.92	78.79
Rep.						
trait	**NFB6**	59.51	22.80	50.02	44.52	20.78
	NFP6	53.96	26.51	38.80	28.33	46.68
	NFrP	53.77	22.59	43.25	36.89	27.27
	FrW	90.43	48.65	58.68	32.82	68.73
	NoSD	47.75	27.31	28.07	6.45	94.72
Nut.						
Traits	**CHO%**	50.27	28.86	29.35	5.32	96.72
	CP%	19.90	11.01	12.39	5.68	79.00
	β car	90.97	49.51	58.09	30.38	72.64
	Vit A	49.67	28.54	28.95	4.85	97.19
	Vit C	55.61	31.32	33.63	12.24	86.75
	Ca	97.75	56.36	56.58	4.98	99.23

VL6W:vine length at 6 WAT; NoBH:number of branches; NFB6:number of flowers per branch at 6 WAT; NFP6:number of flowers per plant at 6 WAT; NFrP:number of fruits per plant; FrW:fruit weight per plot; NoSD:number of seeds per fruit; CHO%:percentage of carbohydrate; CP%:percentage of crude protein; $_{\beta}$car:beta carotene; Vit A:vitamin A content; Vit C:vitamin C content; Ca:calcium content; %CV:coefficient of variation; GCV:genotypic coefficient of variation; PCV:phenotypic coefficient of variation; ECV:environmental coefficient of variation; H^2_{bs}(%):broad sense heritability; Veg.:vegetative; Rep.:reproductive; Nut.:nutritive

4.3 Correlation, path coefficient analysis and path diagram for selected golden melon traits: Correlation and path coefficient analysis and path diagram were used to study six golden melon traits in order to understand their inter-relationship, direct and indirect contribution of these selected traits towards fruit yield.

4.3.1 Correlation showing inter-relationship within selected traits and relation with yield (fruit weight per plant): As presented in table 17 Genotypic and phenotypic correlation coefficients among the selected traits, all the selected traits had a positive correlation with the yield (fruit weight per plant) at both the genotypic and phenotypic level except the number of days to germination trait which had a negative genotypic correlation (-0.304) and negative phenotypic correlation (-0.295) with the yield. The vine length at 6 WAT trait recorded highest positive genotypic correlation (0.748) and phenotypic correlation (0.708) with the yield.

The number of days to 50% flowering trait had a positive genotypic and phenotypic correlation with number of days to germination, number of flowers per plant at 6 WAT and vine length at 6 WAT traits, but a negative correlation with number of branches and number of fruits per plant.

The number of branches trait and a negative genotypic and phenotypic correlation with number of days to germination and number of days to 50% flowering traits, but a positive genotypic and phenotypic correlation other traits.

The number of days to germination trait had a negative genotypic and phenotypic correlation with all other traits except the number of days to 50% flowering trait, number of days to germination trait had the highest negative genotypic and phenotypic correlation with number of fruit per plant trait at -0.515 and -0.488 respectively.

Number of flowers per plant at 6 WAT trait had a positive genotypic and phenotypic correlation with all other traits except the number of days to germination trait, number of flowers per plant at 6 WAT trait had the highest positive genotypic and phenotypic correlation with the vine length trait at 0.713 and 0.630 respectively.

The number of fruits per plant trait also trait had a positive genotypic and phenotypic correlation with all other traits except the number of days to germination trait, number of fruits per plant trait had the highest positive genotypic and phenotypic correlation with number of branches trait (0.694) and vine length (0.644).

Table 17: ***Genotypic and phenotypic correlation coefficients among the selected traits***

Traits	R	ND50%F	NBr	NDG	NFP	NFrP	VL	FrW/Yield
ND50%F	**G**	1.000	-0.167	0.132	0.075	-0.184	0.033	0.247
	P	1.000	-0.137	0.132	0.069	-0.175	0.031	0.240
NBr	**G**		1.000	-0.448 *	0.634 **	0.694 **	0.721 **	0.587 **
	P		1.000	-0.369 **	0.453 **	0.557 **	0.565 **	0.498 **
NDG	**G**			1.000	-0.502 *	-0.515 *	-0.449 *	-0.304
	P			1.000	-0.460 *	-0.488 **	-0.420 **	-0.295 *
NFP	**G**				1.000	0.314	0.713 **	0.316
	P				1.000	0.289 **	0.630 **	0.278 *
NFrP	**G**					1.000	0.683 **	0.642 **
	P					1.000	0.644 **	0.645 **
VL	**G**						1.000	0.748 **
	P						1.000	0.708 **

** Statistically significant correlation at p ≤ 0.05; ** Statistically high significant correlation at p ≤ 0.01; r:correlation;g:genotypic coefficient of variation; p:phenotypic coefficient of variation; ND50%F:number of days to 50% flowering; NBr:number of branches; NDG:number of days to germination; NFP:number of flowers per plant at 6 WAT; NFrP:number of fruit per plant; VL:vine length at 6 WAT; FrW/yield:fruit weight per plant*

4.3.2 Path coefficient analysis showing the effect of selected golden melon traits on yield:

As presented in table 18 Direct and indirect effects of selected golden melon traits on yield, the vine length trait recorded the highest positive genotypic and phenotypic direct effects on the yield (fruit weight per plant) at 0.8580 and 0.5691 respectively. The number of fruits per plant trait had the lowest positive genotypic direct effect on the yield (fruit weight per plant) at 0.0099, while the number of number of branches trait had the lowest positive phenotypic direct effect on yield (fruit weight per plant) at 0.1642.

The number of flowers per plant at 6 WAT had the highest negative genotypic and phenotypic direct effects on the yield (fruit weight per plant) at -0.5980 and -0.2722 respectively. The number of days to germination trait had the lowest negative genotypic and phenotypic direct effects on the yield (fruit weight per plant) at -0.1007 and -0.0076 respectively.

The number of branches trait had the highest positive genotypic indirect effect on yield (fruit weight per plant) through the vine length trait at 0.6189. The number of fruits per plant had the highest positive phenotypic indirect effect on yield (fruit weight per plant) through the vine length trait at 0.3663. The number of flowers per plant at 6 WAT trait had the lowest positive genotypic indirect effect on yield (fruit weight per plant) through the number of fruit per plant trait at 0.0031. The number of branches trait had the lowest positive phenotypic indirect effect on yield (fruit weight per plant) through the number of days to germination trait.

Vine length trait had the highest negative genotypic indirect effect on yield (fruit weight per plant) through the number of flowers per plant at 6 WAT trait at -0.4263. The number of days to germination trait had the highest negative phenotypic indirect effect on yield (fruit weight per plant) through the vine length trait at -0.2389. The number of days to 50% flowering trait had the

lowest negative genotypic indirect effect on yield (fruit weight per plant) through the number of fruit per plant trait at -0.0018. The number of days to 50% flowering trait also had the lowest negative phenotypic indirect effect on yield (fruit weight per plant) through the number of days to germination trait at -0.0010.

The genotypic and phenotypic residual effects were positive and recorded as 0.2198 and 0.3073 respectively.

Table 18: ***Direct and indirect effects of selected golden melon traits on fruit yield***

Traits	ND50%F	NBr	NDG	NFP	NFrP	VL	FrW/Yield	
ND50%F	**0.3379**	-0.0586	-0.0133	-0.0451	-0.0018	0.0283	0.2473	
	0.3198	-0.0225	-0.0010	-0.0188	-0.0554	0.0175	0.2395	
NBr	-0.0563	**0.3516**	0.0451	-0.3793	0.0068	0.6189	0.5868	**
	-0.0439	**0.1642**	0.0028	-0.1233	0.1770	0.3214	0.4983	**
NDG	0.0445	-0.1576	**-0.1007**	0.2999	-0.0051	-0.3854	-0.3042	
	0.0422	-0.0606	**-0.0076**	0.1252	-0.1550	-0.2389	-0.2946	*
NFP	0.0255	0.2231	0.0505	**-0.5980**	0.0031	0.6117	0.3158	
	0.0221	0.0744	0.0035	**-0.2722**	0.0917	0.3584	0.2779	*
NFrP	-0.0622	0.2440	0.0518	-0.1876	**0.0099**	0.5863	0.6422	**
	-0.0558	0.0915	0.0037	-0.0786	**0.3177**	0.3663	0.6448	**
VL	0.0111	0.2536	0.0452	-0.4263	0.0067	**0.8580**	0.7484	**
	0.0099	0.0927	0.0032	-0.1714	0.2045	**0.5691**	0.7079	**

*Bold numbers are the direct effects; Genotypic residual effect: 0.2198; phenotypic residual effect: 0.3073; * Statistically significant correlation at $p \leq 0.05$; ** Statistically high significant correlation at $p \leq 0.01$; ND50%F:number of days to 50% flowering; NBr:number of branches; NDG:number of days to germination; NFP:number of flowers per plant at 6 WAT; NFrP:number of fruit per plant; VL:vine length at 6 WAT; FrW/yield:fruit weight per plant*

4.3.3 Path coefficient analysis diagrams

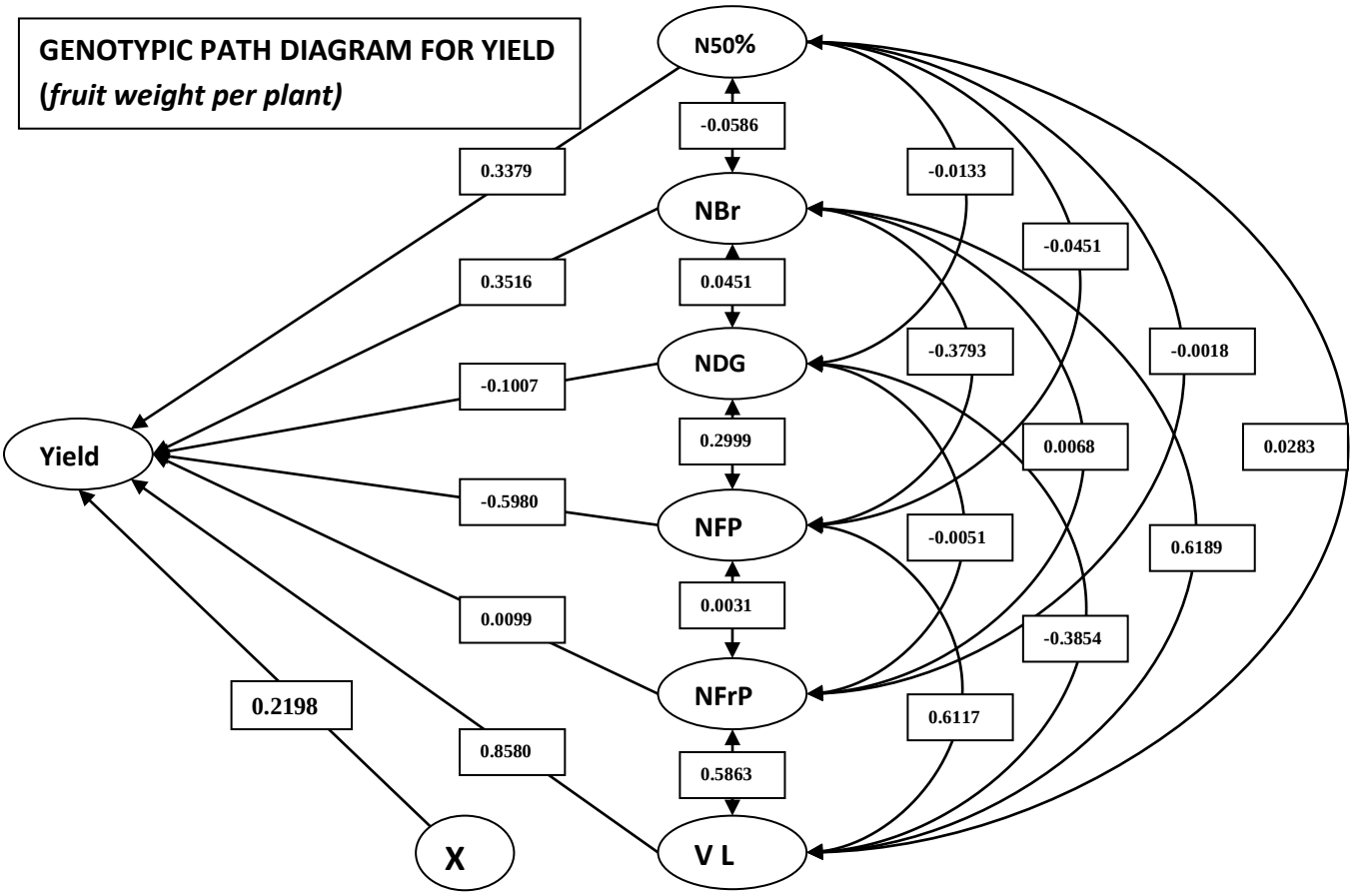

Figure 9: Genotypic path diagram showing direct and indirect effects of selected traits on yield (fruit weight per plant)

ND50%F:number of days to 50% flowering; NBr:number of branches; NDG:number of days to germination; NFP:number of flowers per plant at 6 WAT; NFrP:number of fruit per plant; VL:vine length at 6 WAT; Yield:fruit weight per plant; X:residual effects

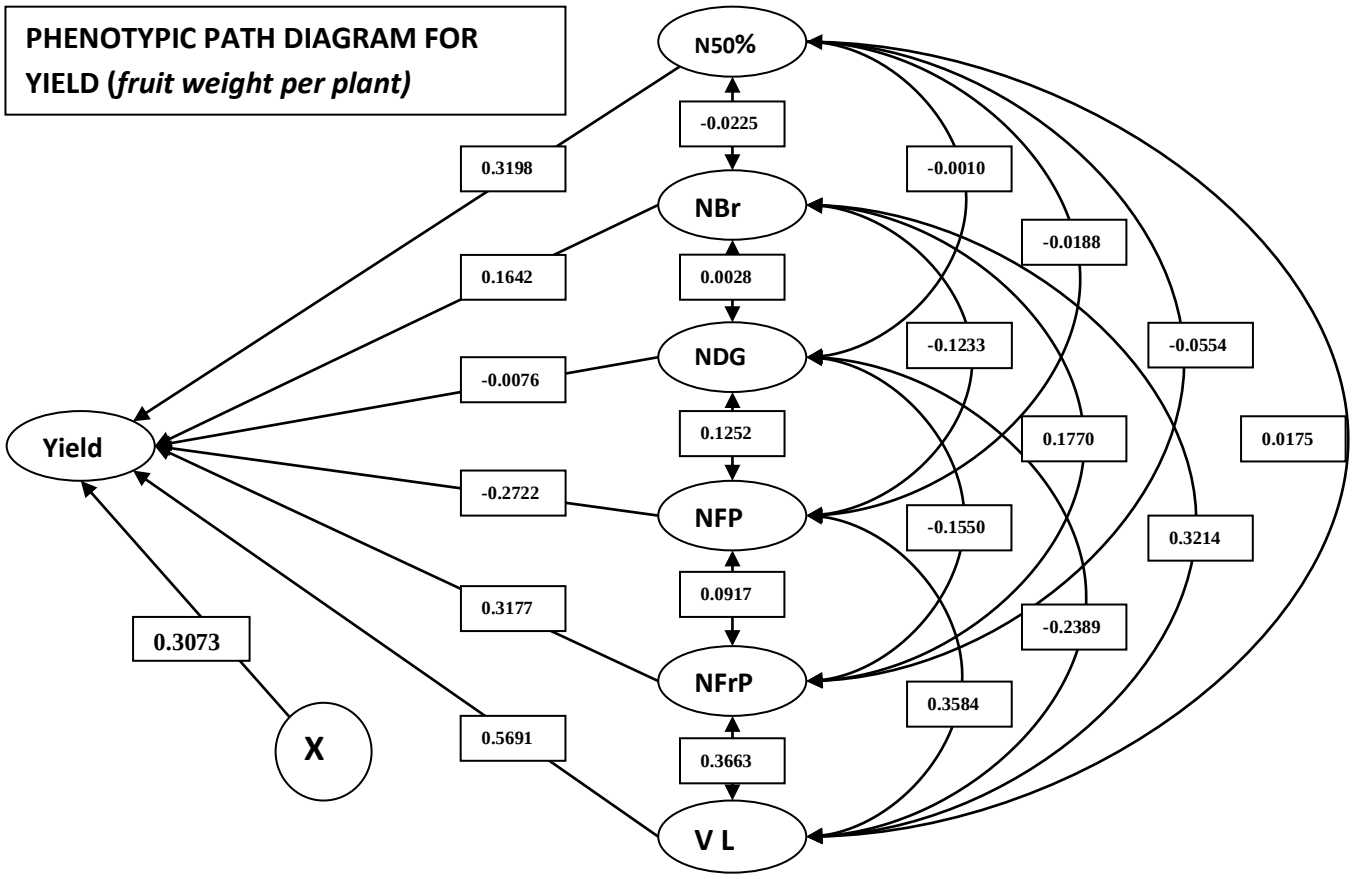

Figure 10: Phenotypic path diagram showing direct and indirect effects of selected traits on yield (fruit weight per plant)

ND50%F:number of days to 50% flowering; NBr:number of branches; NDG:number of days to germination; NFP:number of flowers per plant at 6 WAT; NFrP:number of fruit per plant; VL:vine length at 6 WAT; Yield:fruit weight per plant; X:residual effects

4.4 DISCUSSION OF FINDINGS

4.4.1 Vegetative parameters: The difference in total amount of rainfall in early and late season as indicated in Table 1 may have resulted in significant difference in the vegetative performance of golden melon genotypes. The early season for the year 2020 was from March 2020 to June 2020 and this period recorded the highest amount of total rainfall of 618.74mm while the late season which was from August 2020 to November 2020 had a lower total rainfall of 464.31mm. Higher rainfall in the early season may have led to better performance of the vine length and number of branches vegetative traits in the early season than the late season, since moisture increases organic matter decomposition, solubility and availability of nutrients in the soil resulting to increase in nutrient uptake by plant and increasing vegetative growth in green plants. This is consistent with the findings of Adekiya, Ejue, Olayanju, (2020) who noted that increase in moisture will increase decomposition in the soil to enhance okra growth and Aluko (2020) who noted muskmelon had higher vegetative growth in the early season than the dry and late seasons as a result of adequate availability of water in the early season.

4.4.2 Reproductive parameters: Early season golden melon genotypes had significantly higher performance than late season genotypes in reproductive traits such as number of flowers per branch at 6 WAT, number of flowers per plant at 4 WAT, number of flowers per plant at 6 WAT, number of fruits per plant, fruit size, fruit weight and fruit length. Early season genotypes performance was high but not significantly higher than the late season genotypes in the screen house fruit length trait and number of seeds per fruit trait at both field and screen house experiment. Water a critical factor in agricultural production is very important and should be available at the optimum amount for expected yield (Liu, & Song, 2020). The performance of early season golden melon genotypes in giving higher reproductive traits and recording higher

yield (fruit weight per plant) could be as a result of higher total amount of rainfall in this season compared to late season meaning there was adequate water supply from the rainfall during the flowering stage which is one of the critical stages in plant growth and development as reported by (Ouk et al., 2007), who discovered that grain yield of rice was affected when there was reduction in soil water availability during flowering. Aside abundance of rainfall in the early season, the total rainfall was quite evenly distributed from March 2020 to June 2020 at the location of the experiment Table 1: The late season was not as evenly distributed as the early season rainfall, having a spike increase in the month of September 2020 at 286mm and very low total rainfall for the month of August 2020 at 21.08mm. Evenly distributed rainfall meant there was no incidence of water logging during cultivation of golden melon genotypes during the early season. However excess water availability occurred in the month of September which was also during the flowering period of golden melon genotypes. Water logging results to clogging of macro and micro pores with silt resulting in reduced soil aeration and microbial activities, nitrifying capacity of the soil was also reduced as a result of water logging (Engelaar, Matsumaru, & Yoneyama, 2000). As a result of poor soil aeration and reduction in nitrifying capacity of the soil, flower pollination, fruit initiation and development was reduced, this agrees with the findings of Mohanty, Panda, Rout, Muduli, & Tripathy, (2020) who discovered that fruit setting was reduced from the optimum in tomato varieties as a result of short term water logging during flowering on tomato fruit yield and yield attributes. Though the golden melon genotypes of the late season had reduced fruit initiation as a result of water logging during flowering, the late season had a moderate yield, the successfully pollinated flowers matured and developed under the stable rainfall in the month of October 2020 (157.25mm).

The higher performance of early season genotypes than late season genotypes in most reproductive parameters is as a result of the early season genotypes recording significantly longer vines and more branches. Increase in vine length and number of branches resulted in increase in number of plant parts exposed to sunlight meaning larger surface area for photosynthesis. Increased photosynthesis meant the early season genotypes are able to manufacture more food and store more assimilates for a successful reproductive stage. This correlated with the findings of VanDerZanden, & Cook, (2010), she indicated to photosynthesis occurs in the presence of sunlight and cholorophyll which is located in the mesophyll layers of green plant leaves and some parts of their stem and increase in green vegetative parts means more cholorophyll pigments are available for photosynthesis to manufacture food for increased vegetative growth and storage of assimilates from abundant food manufactured.

4.4.3 Nutritive parameters: The changes in weather parameters for the early and late season did not cause significant difference between the nutritive composition traits of the early season and late season golden melon genotype except for calcium content trait at the screen house experiment where the late season golden melon genotype had significantly higher amount of calcium than the early season genotype. Late season genotype recorded higher calcium content because of the difference in total amount of rainfall between the seasons; the late season with reduced total rainfall will enhance more mineral accumulation with slightly more rigid fruit mesocarp, lower moisture content while the early season with abundant water will enhance organic matter accumulation and more succulent mesocarp (Pardossi, Giacomet, Malorgio, Albini, Murelli, Serra, & Vernieri, 2000).

The ash, carbohydrate, calorie, crude fibre, lipids, protein, beta carotene, vitamin A and vitamin C in golden melon genotype fruits were all significantly influenced by the genotype but not the

season; meaning golden melon fruits retained nutritional qualities under changing weather condition. Difference observed in the nutritional qualities of the golden melon fruits was due to genetic factor and not environmental influences. In a study by Padula & Rodriguez-Amaya (1986), they established that different cultivars of guava fruit samples showed quantitative and qualitative differences in nutritional qualities, especially in carotenoid content which accounted for difference in vitamin A content of cultivars in the study. Tzuri et al., (2015) also concluded in his study of 350 melon ascensions that genetic variation for individual components and in general products of every major pathway in plants is a good foundation for more intensive research of genetic-biochemical metabolism in these plants for exploring the nutritional potential of these cultivars. Genotype and season interaction did not significantly influence nutritive qualities of the golden melon genotypes due to similarity in nutrient management as a basal dose of N P K 15 10 10 was applied to the genotypes at early and late seasons, Correa, Malla, Crosby & Avila (2020) also discovered that genotype and environment interaction was not significant in the evaluation of water melon traits in southern Texas.

4.4.4 Variability: Most of the traits selected for genotypic and nutritional qualities variability study (i.e. vine length at 6 WAT, number of branches, number of flowers per plant at 6 WAT, number of flowers per branch at 6 WAT, number of fruits per plant, fruit weight, number of seeds, carbohydrate, crude protein, beta carotene, vitamin A, vitamin C and calcium) had greater genotypic coefficient of variation than their corresponding environment coefficient of variation meaning variation in the traits is genetic controlled with little environmental influence. This is similar to the study of Aremu, Adebayo, Ariyo & Adewale, (2007) on cowpea, she discussed that higher genotypic coefficient of variation than corresponding phenotypic coefficient of variation meant variation in studied traits are mostly influenced by the genetic factor with little influence

from the environment. The study of Singh, Kumar, & Singh, (2007) on variability in rice hybrid made similar conclusion. The following traits: number fruit per plant, fruit weight, number of seeds, crude protein and calcium from early season filed experiment; number of fruit per plant, fruit weight, beta carotene and vitamin A from early season screen house experiment; number of fruit per plant, crude protein and calcium from the late season field experiment; number of branches, the reproductive traits, carbohydrate, vitamin C, beta carotene, vitamin A and calcium all recorded high percentage of coefficient of variation with high broad sense heritability estimate, meaning these traits are reliable for selection to improve golden melon, Indraja, Syed, Madhumathi, Priya, & Sekhar, (2021) also recorded high heritability in some musk melon traits in his study. Aremu (2012) and Rad, & Rafezi, (2020) also had similar trends in their respective studies, exploring statistical tools for genetic variability study and integrated approaches for better selection of traits in breeding melon. High variability in a population provides foundation for selection to develop varieties with desired characteristics (Aremu 2012).

4.4.5 Correlation: The vine length trait had highly significant positive genotypic correlation with the number of flower per plant at 6 WAT and number of fruit per plant traits. This relationship means increasing the vine length will also result to corresponding increase in the number of flowers per plant and number of fruits per plant. Increasing vine length resulted in the growth of more internodes from which flower buds can develop, therefore golden melon genotypes with longer vines recorded more flowers. Panigrahi, Duhan, Panghal, Tehlan, & Yadav, (2018) made similar discovery in the study of correlation coefficient analysis between yield defining traits of bottle gourd genotypes, he discussed that genotypes with longer vines recorded more flowers than genotypes with significantly shorter vines. Increase in the number of flowers on a vine will also increase the possibility of more fruit initiation which was also why

golden melon with significantly longer vines recorded more fruits than genotype with significantly shorter vines, just as (Silpa et al., 2020) discovered in their pickling melon study, accessions with more flowers recorded most number of fruits in the study. Vine length, number of fruits per plant and number of branches traits all recorded highly significant high positive correlation with the yield (fruit weight per plant). Golden melon genotypes with longer vines, more fruits and more branches recorded more yield (fruit weight per plant) than genotypes with significantly lesser parameters, this agrees with the study of Feyzian, Dehghani, REZAEI, & Jalali, (2009) the study of yield related traits in melon and concluded yield was positively correlated with number of primary branches of melon. Malik *et al.,* (2012) in the study of *Citrullus lanatus* genotypes also observed that fruit yield per plant had a significant positive correlation with number of branches per plant and number of fruits per plant.

4.4.6 Path coefficient analysis: the use of correlation alone in estimating the relationship and effect of crop traits on yield can be misinterpreted and become ineffective in selecting targeted yield related traits; using correlation in selecting traits is therefore more effective when used with path coefficient analysis Gonçalves et al., (2017). Path coefficient analysis for fruit yield (table 17) showed that the vine length at 6 WAT, number of fruit per plant and number of branches traits had the positive genotypic and phenotypic direct effect on the yield (fruit weight/plant) with corresponding positive correlations with the yield (fruit weight/plant) which were highly significant. This means increase in any of the traits listed above may have resulted in corresponding increase in the yield (fruit weight/plant) of golden melon genotypes, this is in line with the study of Triveni, Uma Jyothi & Dorajee Rao, (2021). The number of days to germination trait had a negative genotypic and phenotypic effect on yield (fruit weight/plant) with a corresponding negative phenotypic correlation with yield, meaning an increase in number

of days to germination may result to a corresponding reduction in yield. This was the mechanism; golden melon genotypes with fewer number of days to germination had high seedling vigor and quickly made use of the available nutrients and moisture in the nursery soil for vigorous growth before emergence of weeds (Liao, Fillery, & Palta, 2004). The absence of competition for nutrient and moisture in the soil ensured availability of plant nutrient for the young seedlings. Though no visible symptoms for nutrient deficiency was observed in the genotypes with more days to maturity, they still had to compete for moisture and nutrients with few emerged weeds which may have resulted in fewer nutrient uptake than the optimum (Sunitha, Reddy, & Reddy, 2011). Though the number of flowers per plant at 6 WAT trait had a positive genotypic and phenotypic correlation with the yield, it recorded the highest negative direct effect on yield amongst the considered traits but also had a high positive indirect effect on yield via vine length as shown in table 14. An increase in number of flowers on a plant means there is more demand for nutrient and moisture which may not be optimum for individual flowers and can result in flower abortion. Fewer flowers on a plant therefore have lower pressure on available plant nutrients and there is higher chance of each flower having sufficient nutrient for fruit initiation (Wu, Xiang & Zhang, 2018). However increase in number of flowers per plant with corresponding increase in vine length means increase in number of leaves and total green areas for photosynthesis, increasing syntheses of assimilates and thereby increase fruit initiation and fewer flower abortions.

CHAPTER FIVE

5.0 CONCLUSION AND RECOMMENDATION

5.1 CONCLUSION

The early season genotypes recorded significantly higher vegetative characters than the late season genotypes in the following characters; vine length at 4 and 6 WAT in the field experiment, vine length at 2 and 6 WAT in the screen house experiment, number of branches at 6 WAT in the field experiment and number of branches at 6 WAT in the screen house experiment. Caribbean queen F1 (V5) recorded significantly longer vine length at 2, 4 and 6 WAT in the field experiment, Epsilon F1 (V3) had longest vine at 2 WAT in the screen house experiment, Delta F1 (V4) recorded longest vine at 6 WAT in the screen house experiment, Delta F1 (V4) also recorded most branches in the field experiment and Caribbean queen F1 recorded most branches in the screen house experiment.

Early season genotypes had significantly higher reproductive characters than late season genotypes in all the reproductive characters except in; number of flowers per branch at 4 WAT in field and screen house experiments, fruit length in screen house experiment and number of seeds per fruit in field and screen house experiments. Epsilon F1 (V3) recorded significantly higher reproductive characters than other genotypes for most of the traits except in; number of flowers per branch at 4 and 6 WAT in field and screen house experiments, number of flowers per plant at 4 and 6 WAT in field experiment, number of flowers per plant at 6 WAT in screen house experiment and number of fruits per plant in field and screen house experiments.

In the study of the nutritive composition of golden melon genotypes, there was no significant difference between early and late season nutritive characters except in the calcium content trait where late season recorded significantly higher calcium content than early season. DAYO F1 (V1) and Epsilon F1 (V3) recorded significantly higher nutritive characters for most of the nutritive traits. Epsilon F1 (V3) had the highest carbohydrate value in both field and screen house experiments. DAYO F1 (V1) had high a protein, Vitamin A and Carotene content in the study.

Vine length trait had the high positive direct effect on fruit yield (fruit weight (kg)/plant) amongst golden melon genotype characters. The number of fruit per plant and number of branches traits also recorded positive direct effect on fruit yield. The number of flowers per plant trait recorded the high negative direct effect on fruit yield.

5.2 RECOMMENDATIONS

From the conclusion of studying variability in phenotypic and nutritive composition of selected golden melon genotypes, the early season planting period of March to June is the best planting period for the vegetative and reproductive traits of the golden melon genotypes as the early season golden melon genotypes performed best in both the field and screen house.

Caribbean queen F1 (V5) and Delta F1 (V4) genotypes are recommended for cultural practices such as cover cropping and green manure composting due to their abundant vegetative parameters, field cultivation is recommended for Caribbean queen F1 (V5) while screen house cultivation is recommended for Delta F1 (V4) optimum “green” use.

Epsilon F1 (V3) is recommended to farmers for possible cultivation for reproductive parameters such as fruit size, fruit weight per plant, fruit length and number of seeds per plant. This same

genotype is also recommended to nutritionists and researchers who are solely interested in the carbohydrate content of food substances; it recorded the highest carbohydrate content among the golden melon genotypes in both the field and screen house experiments.

DAYO F1 (V1) recorded highest values for protein, carotene and vitamin A in the field and screen house experiments in its fruit samples. This indicates its potential for consideration in nutrition plans and is therefore recommended a part of fruit servings.

From studying the genetic qualities of the selected golden melon genotypes, the following characters of golden melon genotypes are recommended to plant breeders, geneticists and researchers for genetic improvement and selection purposes since they recorded high genetic coefficient of variation compared to corresponding environmental coefficient of variation;

- Number fruit per plant, fruit weight, number of seeds, crude protein and calcium from early season filed experiment.
- Number of fruit per plant, fruit weight, beta carotene and vitamin A from early season screen house experiment
- Number of fruit per plant, crude protein and calcium from the late season field experiment
- Number of branches, the reproductive traits, carbohydrate, vitamin C, beta carotene, vitamin A and calcium.

From studying the inter-relationship between traits and relationship between selected traits and fruit yield, practices that will enhance vine growth are recommended to farmers and researchers so as to increase the yield of golden melon genotypes.

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