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PERFORMANCE OF TOMATO CULTIVARS GROWN AS INTERPLANT CROP IN BETWEEN WOODY TREES. ١. TOMATOS YIELD AND FRUITS QUALITY

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ABSTRACT

This investigation was carried out at the Tropical Farm, Kom-Ombo, Aswan Governorate Egypt, during the winter season of ٢٠٠٧ and ٢٠٠٨.The purpose of this study was to investigate the performance of tomato plants *(Lycopersicon esculentum* L. Mill) cvs. Castle Rock and Strain B grown between *Khaya* trees as an agroforestry system. *Khaya senegalensis* A. Juss trees were cultivated at spacing of ٣.٥ X ٣.٥m apart, and had ٤ years old at the beginning of this study on a loam sandy soil. Tomato cultivars were fertilized by using ٢٠٠ and ٣٠٠ kg/ fed potassium sulphate (soil application) as well as potassium chelate applied as spray at rates of ١.٥ and ٣ Cm/ L. Significantly highest values were observed in respect of yield of tomato cultivars when plants fertilized with ٣٠٠ kg/fed potassium sulphate. However, potassium fertilization with "Castle Rock" cv. have proven to be highly efficient means of fulfilling the best results for vitamin C, fruit weight ,fruit shape index, and total yield. Meanwhile, the highest values of titratable acidity, reducing sugar, number of locules/ fruit and total soluble solids were obtained with "Strain B" cultivar.

INTRODUCTION

Vegetables as tomato plants are one of the essential nutrient suppliers for our daily diet. To increase the production of vegetables our perior need can be easily attained through the cultivation of vegetables under different light levels permitted by the upper storey crops like woody trees. Agroforestry system offers production of various vegetables under different shade conditions by maximum utilization of natural recourses like Photosynthesis Active Radiation (PAR) levels (Taleb, ٢٠٠٣). Farmers adopt agroforestry practices for two reasons: increase their economic stability and improve the management of natural resources under their care. Nowadays, agroforestry system is an important structure for farming the desert in Egypt. It includes at least two plant species that interact biologically, one of them is a woody perennial and the other is annual or perennial crop plantation (Somarriba, ١٩٩٢). The important aspect of agroforestry is the potential of trees for microsite enrichment (Nair, ١٩٨٤). On the other side, a combination of woody and non-woody plants show to change the microclimate, which in turn influence the growth of all components of the system (Brenner, ١٩٩٦).

Potassium (K) is require for all plants and animals life. Plants require potassium for photosynthesis, osmotic regulation and the activation of enzymes system. Potassium deficiency in tomato results in chlorotic of older leaves with scattered dead spots as well as uneven ripening in fruit (blotchy) .However, potassium deficiency in tomato can often be corrected with the use of foliar at ٢٪ potassium sulfate.

Egyptian population and economic are growing rapidly. The demand is increasing for materials used in providing shelter, timber, and most forms of manufacture and industry because of the limited area of land available for cultivation in Egypt, therefore, it is important to maximize land use. This necessitated keen and eager search for new land, which could be productive after being reclaimed at reasonable cost. Thus, a considerable attention is recently paid to the southern parts as Toshka, which is the major project in this area. Soil classification in this area pointed out that ٥٠٪ of it is above the ٤th grade; temperature degree ranged between ٤٠-٥٠°C in Summer and

٢٠-٣٠°C in Winter; humidity is ١٢-٢٣٪ around the year. However, the main problem in the new reclaimed sandy soil is potassium shortage that may affect the growth of agroforestry system. Both woody and annual plantations in this system need potassium fertilization.

From the above statements, there have been a great scope and essentialities of cultivation of vegetable crops as tomato plants under agroforestry production system. Consequently this study was conducted to evaluate yield quantity and quality of two tomato cultivars "Castle Rock" and "Strain B" grown between *Khaya* trees with potassium fertilization treatments.

MATERIALS AND METHODS

This study was carried out the Tropical Farm Horticulture Research Institute; Agricultural Research Center, Kom Ombo, Aswan, Egypt during the two successive winter seasons of ٢٠٠٧ and /٢٠٠٨. The aim of this investigation was to study growth and productivity of tomato plants cultivars "Castle Rock" and "Strain B" seeded between *Khaya* trees as an agroforestry system .The soils are classified as loam sandy with pH ٨.٢, low organic matter content (٠.٤٠), potassium concentration averaged about ٠.١٤ meq/ L in the soil surface and E.C about ٠.٢٧. The tree used was *Khaya senegalensis* A. Juss at a spacing of ٣.٥ by ٣.٥ m. The age of the trees were about ٤-years old at the starting of this study . Height and stem diameter of *Khaya* trees averaged ٢.٨٠ m and ١٦ cm, respectively. Seeds of (*Lycopersicon esculentum* L.Mill) Cvs "Castle Rock" and "Strain B" were obtained from Agricultural Research Center.

Seeds of tomato cultivars were planted in nursery on ٢١ August ,٢٠٠٧and ٢٠٠٨ seasons. Seeds were sown in peat moss media . The media was moist once daily. The seeds were sown uniformly over the surface of containers (flat). Then covered with vermiculite till they were just hidden and the container were placed in a polyethylene bag till germination . The seedlings were transplanted from the nursery when the transplants were ١٠-١٥ Cm length to the experimental site.

Ten rows of the trees were established in ٣٥ m long at a spacing of ٣.٥ x ٣.٥ m for a total ١١٠ trees in the two studied seasons. Tomato

cultivars were transplanted in rows ١.٠ m apart as width and within row ٣٠ Cm apart between each two transplants in plot ٣.٥x٣.٥ m . The tree rows and alleys have a north- south orientation .The experimental design was a split plots in a randomized complete blocks system with four replicates. The main plots contained the two tomato cultivars (Castle Rock and Strain B) and the four potassium rates were arranged in the sub plots. All treatments were arranged at random in the fore mentioned plots. There was a ٣.٥ m border area between plots to avoid the effect of fertilization treatments. Standard fertilization regimes were used with ٨٢ kg N/fed added annually as ammonium sulphate and ٤٥ kg P_2O_5/fed to the crop alleys . Moreover, ٤ levels of potassium treatments were added to tomato cultivars as following : (a) ٢٠٠ kg potassium sulphate /fed (on the soil surface), (b) ٣٠٠ kg potassium sulphate/fed (on the soil surface) ; these treatments were divided into three doses: the first was applied three weeks after transplanting, the second dose was applied three weeks after the first, and the third dose was applied ٣ weeks after the second one (c) spraying potassium chelate at the rate of ١.٥ Cm/L and (d) spraying potassium chelate at the rate of ٣ Cm/L; treatments were divided into ٢ doses: the first was sprayed one month after transplanting, and the second was applied at the flowering stage . Each replicate contained ٨ plots and each plot was ٣.٥ x ٣.٥ m with three rows and ١٢ plants in each row. Each plot contain two rows of trees. All agricultural practices known for tomato production other than the used treatments were followed.

Ten plants were randomly taken to determine the mean weight of fruits /plant (kg) and total yield (ton /fed) . Ten ripped fruits from the third picking were randomly taken to determine average weight per fruit (g), fruit shape index, number of locules/fruit , vitamin C (mg/١٠٠ g juice) ,titratable acidity (%) ,total soluble solids (TSS) %, and reducing sugars (%). All spectrophtometric assays were performed using a Milton Roy spectrophotometer (Milton Roy Spectronic ١٢٠١) . All means were compared using LSD at ٥ and ١ % level according to Gomez and Gomez (١٩٨٤).

RESULTS AND DISCUSSIONS

Average weight of fruits "Kg" and total yield(Ton/fed.):

Data in Table ١ show that Cv. "Castle Rock" significantly surpassed Cv. "Strain B" in these two parameters , in both seasons. The obtained data for Cv. "Castle Rock" were ١.٨٦ and ١.٨٦ Kg weight of fruits/plant and ٢٥.٧٣ and ٢٥.٥٤ ton/fed total yield whereas, Cv. "Strain B" gave ١.٣٣ and ١.٣١ Kg weight of fruits/plant and ١٨.١٤ and ١٨.٠٠ ton/fed total yield, in the first and second seasons, respectively. K treatments, significantly effected the two characters , in both seasons. Among the different treatments , application of ٣٠٠ Kg K_2SO_4/fed. gave the most promising values for average weight of fruits/plant ١.٨٧ and ١.٨٥ Kg and (٢٥.٧٧ and ٢٥.٤٣ ton/fed.) for total yield, in the first and second seasons, respectively. Spraying tomato plants with K chelate at ١.٥ Cm/Liter gave the lowest values of both parameters, in both seasons. Concerning the interactions between Cvs. X K treatments , significant effect was attained in both seasons. The interaction of Cv. "Castle Rock" with ٣٠٠Kg K_2SO_4 was to be the most superior treatment i.e.; (٢.١٥ and ٢.٢٢ Kg) for weight of fruits/plant and (٢٩.٧٧ and ٣٠.٥٣ ton/fed.) for total yield, in the first and second seasons, respectively. On the other hand, the lowest values were obtained from the interaction of Cv. "strain B" with spraying tomato plants by ١.٥ Cm / litre potassium chelate i.e., ١.١٥ and ١.١٧ kg for weight of fruits / plant and ١٥.٧٦ and ١٦.٢٤ ton / fed. for total yield, in the first and second seasons, respectively. These results are in agreement with those obtained by Abd-Alla *et al.* (١٩٩٥). The results by Abdel ati (١٩٩٨) on potato also in agreement with present results. However, Peyvast *et al* (٢٠٠٩) reported that application of potassium solution during the growth period of tomato did not affect total fruits yield.

Weight of fruit (g) and fruit shape index:

Data in Table ٢ show that Cv. "Castel Rock" significantly surpassed cv: "Strain B" in fruit shape index in both seasons. The obtained data for "Castle Rock" cultivar were ٨٨.٦٦ and ٨٤.٧١ g fruit weight and ١.٢٩ and ١.٢٧ fruit shape index. Whereas, Cv. "Stain B" were ٨٣.٣٢ and ٨٤.٧١ g fruit weight and ١.٠٧and ١.٠٧ for fruit shape index

parameter, in the first and second seasons, respectively. Potassium treatments, had significant effect on the two characters, in both seasons. Among the different treatments, application of ٣٠٠ kg K_2SO_4 / fed. showed to be the most promising, (٩٨.٧١ and ٨٩.٧٢ g) for weight of fruit (g) and for fruit shape index (١.٢٣ and ١.١٩) in the first and second seasons, respectively. Whereas, spraying with potassium chelate at ٣ Cm / Liter gave the highest values on both characters, in both seasons. The interactions between Cvs X K treatments, significantly effected the two characters in both seasons except weight of fruit (g) in the second season. The interaction of Cv. " Castle Rock" with ٣٠٠ Kg K_2SO_4 showed to be the most superior treatment for fruit weight (١٠٩.٦٥ and ٩٢.٠٠ g) in the first and second seasons, respectively. On the other hand, the lowest values were obtained from the interaction of Cv. " Castle Rock" X B٣ i.e., (٧٦.٠٠ and ٧٦.٤٩) for weight of fruit (g) in the first and second seasons, respectively. But for character fruit shape index the the lowest values (١.٠٥) were obtained when C.v "Strain B" sprayed with ٣ Cm / Liter potassium chelate in the first season while, in the second season also for character fruit shape index the lowest value (١.٠٥) was obtained when Cv. "Strain B" sprayed with ١.٥ Cm / Liter potassium chelate. Jimenez *et al* (١٩٨٨) pointed out that the highest of coffee were obtained after fifteen years in associations with Khaya sp.

Titratable acidity and reducing sugar :

Data in Table ٣ reveal that cultivars "Castle Rock" and "Strain B" had insignificant effect on titratable acidity in the first and second seasons, respectively, but the effect was significant on reducing sugar. The obtained data showed that for Cv. "Castle Rock" resulted on (o.٣٥ and ٠.٣٣٪) for and (were ١.٧٣ and ١.٦٧ %) titratable acidity for reducing sugar, whereas, Cv. " Strain B" were (٠.٣٦ and ٠.٣٤), titratable acidity % i.e.; and ٢.٢٠ and ٢.٤٥٪ reducing sugar in the first and second seasons, respectively. Regarding the effect of potassium treatments, significant effects were observed on the two characters in both seasons. Among the different treatments, application of ٣٠٠ kg k_2So_4/fed .showed to be the most promising i.e.; (٠.٣٩ and ٠.٤٠ %) of titratable acidity percentage in the first and second seasons

respectively . while application of ٢٠٠ kg K٢SO٤ per fed. showed to be the most promising i.e; (١.٩٤ and ١.٩٩ %) of reducing sugar in the first and second seasons . whereas , spraying tomato plants with potassium chelate at ١.٥ Cm /liter showed the lowest value (٠.٣١) in the second season for character titratable acidity percentage but the lowest value (٢.٠٢) was obtained when tomato plants were sprayed with ٣ Cm /liter potassium chelate in the first season for reducing sugar percentage. Concerning the interactions between cultivars and potassium treatments significant effect was attained in the first season for titratable acidity. The interaction of cv "Castle Rock" with ٣٠٠ kg $K_٢SO_٤$ showed the highest values (٠.٤٠ and ٠.٤٠ %) for titratable acidity in the first and second seasons. The interaction between cultivar "Castle Rock" and ٢٠٠ kg $K_٢SO_٤$ / fed. gave the highest values (١.٩٠ and ١.٨٤) for reducing sugar percentage in the first and second seasons, respectively. The lowest values of titratable acidity (٠.٣٨) were obtained from interaction of Cv. " Strain B" with ٣٠٠ kg $K_٢S_{o٤}$/fed (٠.٣٨) in the first season (٠.٣٦) when cv "Strain B" fertilized with ٢٠٠ kg $K_٢SO_٤$ per feddan in the second season. Spraying tomato plant with potassium chelate at ١.٥ Cm /liter gave the lowest titratable acidity value (٠.٣١) and lowest (٢.٠٢) reducing sugar with cultivar "Castle Rock" in the first and second seasons, respectively. The highest values (٠.٣٥ and ٠.٣٢) titratable acidity in the first and second seasons, when tomato plants of Cv. "Strain B" sprayed with potassium chelate at ٣ Cm/liter but for reducing sugar the highest values (٢.٧٤) were obtained when tomato plants of Cv. "Strain B" sprayed with potassium chelate at ١.٥ Cm /liter in the first season and (٢.٩١) when tomato plants Cv. "Strain B" sprayed with K chelate at rate ٣ Cm/liter in the second season . Potassium is an essential plant mineral element having a significant influence on many human health related quality in fruits and vegetables (Usherwood, ١٩٨٥). The findings of Adams *et. al.* (١٩٧٨); Munson (١٩٨٥) and Peyvast *et. al* (٢٠٠٩) are in agreement with our results. Munson (١٩٨٥) reported that potassium plays a key role in enhance sugars of tomato fruits.

Number of locules/fruit and total soluble solids % (TSS).

Data in Table ٤ indicate that cultivars "Castle Rock and "Strain B" had a significant effect on these two parameter in both seasons except number of locules in the second season .The obtained results show that cultivar "Castle Rock" gave ٣.٦٣ and ٣.٨٣ for number of locules in the first and second seasons and ٣.٩٩ and ٣.٩٨ for total soluble solids, in the first and second seasons, respectively. Whereas, the values for Cv. "Strain B" were ٣.٩٨ and ٣.٨٣ locules/fruit and ٤.٣٨ and ٤.٥٥ total soluble solids in the first and second seasons, respectively. Potassium treatments, had significant effect on the two parameters, in both seasons except total soluble solids in the first season .The highest values of locules (٤.٠٥ and ٤.٠٠) were obtained when ٢٠٠ Kg $K_٢SO_٤$ were applied in the first and second seasons, whereas, (٤.٤٥ and ٤.٩٢) for total soluble solids in first and second seasons, when plants fertilized with ٣٠٠ Kg /fed.$K_٢SO_٤$ respectively. Spraying tomato plants with potassium chelae at ٣ Cm/ Liter gave the highest values (٣.٥٨ and ٣.٥٢) for number of locules and (٤.١٥ and ٤.٢٤) for total soluble solids in the first and second seasons , respectively .The interactions between cultivars and potassium treatments , had a significant effect in the first season only on locales/fruit and total soluble solids. The interaction of Cv. "Castle Rack" with ٣٠٠kg $K_٢ SO_٤$ / fed showed to be the most superior treatment (٣.٩٣ and ٣.٩٧) for number of locules /fruit and (٤.٧٠ and ٤.٤٤) for total soluble solids in the first and second seasons , respectively . On the other hand , the lowest values were obtained from the interaction of cv. "Strain B" with ٣٠٠ Kg $K_٢SO_٤$ / fed. for number of locules / plant (٤.١٧ and ٣.٩٧) in the first and second seasons and (٤.٢٠) for total soluble solids only in the first season . Similar, results were reported by Wright and Harris (١٩٨٥) and Hartz *et. al.* (٢٠٠٧).

Vitamin C mg/١٠٠gm:

Data in Table ٥ illustrate that cultivars "Castle Rock" and "Strain B" had a significant effect on vitamin C content in both seasons. The obtained results showed that Cv. "Castle Rock" (١٨.٩٠ and ١٨.٨١ mg/١٠٠g) and surpassed in vitamin C content Cv. "Strain B' (١٧.٩٧

and ١٨.٠١ mg/١٠٠g) in the first and second seasons, respectively. Potassium applications, had significant effect on vitamin C content in both seasons. The highest values (٢٠.٨٦ and ٢٠.٨٣ mg/١٠٠g) were obtained when tomato plants received ٣٠٠ Kg K_2SO_4 in the first and second seasons, respectively. Whereas, spraying tomato plants with K chelate at ٣ Cm/Liter gave the highest values (١٩.٦٤ and ١٩.٢٤ mg/١٠٠g) of mg/١٠٠ V.C, in both seasons. The interactions between cultivars and potassium treatments had a significant effect only in the first season. The interaction of cultivars "Castle Rock" and "Strain B" with ٣٠٠ Kg K_2SO_4/fed. showed to be the most superior treatments (٢٠.٩٨ and ٢٠.٩٨ mg/١٠٠g) for Cv. "Castle Rock" and (٢٠.٧٣ and ٢٠.٦٨ mg/١٠٠g) for Cv. "Strain B" in the first and second seasons, respectively. The lowest values (١٦.٨٩ and ١٦.٧٣ mg/١٠٠g) for cultivar "Castle Rock" and (١٣.٩١ and ١٥.٢٨ mg/١٠٠g) for cultivar "Strain B" when tomato plants were sprayed with ١.٥ Cm/Liter potassium chelate in the first and second seasons, respectively. Anac and Marten-Prevel(١٩٩٩) pointed out that the most important function of potassium in plant metabolism is enzyme activation. Accumulation of carbohydrates, organic acids and other crop-specific ingredients are highly dependent on optimal photosynthesis, the intensity of which is related to K status in the plant. Anac and Colcoglu (١٩٩٥) found that K increased the ascorbic acid concentration in tomato fruits.

One of the major causes of improving crop growth and active substances under a canopy of *Khaya* trees is the improvement of microclimate in term wind speed, soil temperature, dew point and relative humidity, as a result of shading the soil (Ebeid, ٢٠٠٦).

In conclusion, both residues of the used trees and adding potassium fertilizer played an important role in contributing nutrition to the alleyed crops and trees in the agroforestry system. However, utilization and recycling of soil nutrients is improved. Wood or other tree products are produced in addition to agronomic crops, with no reduction in crop yields per unit area.

In a limited resources country like Egypt, agroforestry system can play a significant contribution of the multiple component yield and economic condition of the farmers. From this study, tomato in

between khaya trees gave highest yield per unit area. So, vegetables as tomato under this agroforestry system might be encouraged. From, this study it could be recommend that sowing Castle Rock cultivar and using potassium sulphate at rate of ٣٠٠ kg/ fed. may result in the highest yield and fruit quality under the quite similar conditions.

Table١: Effect of potassium fertilization on weight of fruits/ plant (kg) and total yield(ton/fed) of two tomatoes Cvs. grown in between *Khaya senegalensis* trees in ٢٠٠٧ and ٢٠٠٨ seasons.

Treatments Cultivars / Fertilization		Fruits weight/plant(kg)		Total yield (ton/fed)	
		٢٠٠٧	٢٠٠٨	٢٠٠٧	٢٠٠٨
Castle Rock(A١)	B١	١.٧٩	١.٨٦	٢٤.٦٤	٢٥.٥٥
	B٢	٢.١٥	٢.٢٢	٢٩.٧٧	٣٠.٥٣
	B٣	١.٤٠	١.٣٦	١٩.٧٤	١٨.٦٧
	B٤	٢.٠٩	٢.٠٠	٢٨.٧٦	٢٧.٤٠
Mean of A١		١.٨٦	١.٨٦	٢٥.٧٣	٢٥.٥٤
Strain B(A٢)	B١	١.١٩	١.١٨	١٦.١٢	١٦.٢٤
	B٢	١.٦٠	١.٤٨	٢١.٧٧	٢٠.٣٣
	B٣	١.١٥	١.١٧	١٥.٧٦	١٦.٠٦
	B٤	١.٣٨	١.٤١	١٨.٩٠	١٩.٣٦
Mean of A٢		١.٣٣	١.٣١	١٨.١٤	١٨.٠٠
Mean of B	B١	١.٤٩	١.٥٢	٢٠.٣٨	٢٠.٨٩
	B٢	١.٨٧	١.٨٥	٢٥.٧٧	٢٥.٤٣
	B٣	١.٢٨	١.٢٧	١٧.٧٥	١٧.٣٧
	B٤	١.٧٤	١.٧١	٢٣.٨٣	٢٣.٣٨
LSD at ٠.٠٥		A: ٠.٠٣ B: ٠.٠٥ AB: ٠.٠٢	A: ٠.٠١ B: ٠.٠٤ AB: ٠.٠٦	A: ٠.٤٥ B: ٠.٦٥ AB: ٠.٩٢	A: ٠.١٨ B: ٠.٦٠ AB: ٠.٨٥

B١= ٢٠٠kg potassium sulphate/fed B٢=٣٠٠kg potassium sulphate/fed
B٣= ١.٥ Cm/ L potassium chelate (spray) B٤= ٣ Cm/ L potassium chelate (spray)

Table ٢: Effect of potassium fertilization on mean weight per fruit (g) and fruit shape index of two tomatoes Cvs. grown in between *Khaya senegalensis* trees in ٢٠٠٧ and ٢٠٠٨ seasons.

Treatments Cultivars	Fertilization	Fruit weight (g)		Fruit shape index	
		٢٠٠٧	٢٠٠٨	٢٠٠٧	٢٠٠٨
Castle Rock(A١)	B١	٧٨.٨٧	٨٣.٩٥	١.٣١	١.٣٠
	B٢	١٠٩.٦٥	٩٢.٠٠	١.٣٦	١.٣١
	B٣	٧٦.٠٠	٧٦.٤٩	١.١٨	١.١٧
	B٤	٩٠.١٢	٨٦.٣٨	١.٣١	١.٢٩
Mean of A١		٨٨.٦٦	٨٤.٧١	١.٢٩	١.٢٧
Strain B(A٢)	B١	٨١.٦٣	٨٦.٥٨	١.٠٧	١.٠٧
	B٢	٨٧.٧٨	٨٧.٤٤	١.١١	١.٠٩
	B٣	٧٨.١٠	٧٨.٦٤	١.٠٦	١.٠٥
	B٤	٨٥.٧٨	٨٦.١٠	١.٠٥	١.٠٨
Mean of A٢		٨٣.٣٢	٨٤.٧١	١.٠٧	١.٠٧
Mean of B	B١	٨٠.٢٥	٨٥.٢٧	١.١٩	١.١٩
	B٢	٩٨.٧١	٨٩.٧٢	١.٢٣	١.٢٠
	B٣	٧٧.٠٥	٧٧.٥٧	١.١٢	١.١١
	B٤	٨٧.٩٥	٨٦.٢٤	١.١٨	١.١٨
LSD at ٠.٠٥		A: NS B: ٢.١٩ AB: ٣.١٠	A: NS B: ٠.٩٥ AB: NS	A: ٠.٦١ B: ٠.٩١ AB: ١.٢٩	A: ٠.٦٩ B: ١.٠٣ AB: ١.٤٦

B١= ٢٠٠kg potassium sulphate/fed B٢=٣٠٠kg potassium sulphate/fed
B٣= ١.٥ Cm/ L potassium chelate (spray) B٤= ٣ Cm/ L potassium chelate (spray)

Table ٣: Effect of potassium fertilization on titratable acidity (%) and reducing sugar (%)of two tomatoes Cvs. grown in between *Khaya senegalensis* trees in ٢٠٠٧ and ٢٠٠٨ seasons.

Treatments Cultivars	Fertilization	Titratable acidity %		Reducing sugar %	
		٢٠٠٧	٢٠٠٨	٢٠٠٧	٢٠٠٨
Castle Rock(A١)	B١	٠.٣٩	٠.٣٣	١.٩٠	١.٨٤
	B٢	٠.٤٠	٠.٤٠	١.٣٧	١.٣٢
	B٣	٠.٢٩	٠.٣٠	١.٧٦	١.٦٣
	B٤	٠.٣١	٠.٣١	١.٩٠	١.٨٩
Mean of A١		٠.٣٥	٠.٣٣	١.٧٣	١.٦٧
Strain B(A٢)	B١	٠.٣٩	٠.٣٦	١.٩٩	٢.١٣
	B٢	٠.٣٨	٠.٣٧	١.٩٣	١.٩٠
	B٣	٠.٣٣	٠.٣٢	٢.٧٤	٢.٨٧
	B٤	٠.٣٥	٠.٣٢	٢.١٥	٢.٩١
Mean of A٢		٠.٣٦	٠.٣٤	٢.٢٠	٢.٤٥
Mean of B	B١	٠.٣٩	٠.٣٥	١.٩٤	١.٩٩
	B٢	٠.٣٩	٠.٤٠	١.٦٥	١.٦١
	B٣	٠.٣٣	٠.٣١	٢.٢٥	٢.٢٥
	B٤	٠.٣١	٠.٣٢	٢.٠٢	٢.٤٠
LSD at ٠.٠٥		A: NS B: ٠.٠٠١ AB: ٠.٠٠٢	A: NS B: ٠.٠١ AB: NS	A: ٠.٠٢ B: ٠.٠٣ AB: ٠.٠٤	A: ٠.٠٢ B: ٠.٠٣ AB: ٠.٠٤

B١= ٢٠٠kg potassium sulphate/fed B٢=٣٠٠kg potassium sulphate/fed
B٣= ١.٥ Cm/ L potassium chelate (spray) B٤= ٣ Cm/ L potassium chelate (spray)

Table ٤: Effect of potassium fertilization on number of locules / fruit and total soluble solids (%)of two tomatoes Cvs.grown in between *Khaya senegalensis* trees in ٢٠٠٧ and ٢٠٠٨ seasons.

Treatments Cultivars	Fertilization	Number of locules/ fruit		Total soluble solids	
		٢٠٠٧	٢٠٠٨	٢٠٠٧	٢٠٠٨
Castle Rock(A١)	B١	٣.٦٣	٣.٦٧	٣.٩٩	٣.٩٦
	B٢	٣.٩٣	٣.٩٧	٤.٧٠	٤.٤٤
	B٣	٣.٣٠	٣.٤٠	٣.٤٤	٣.٥٥
	B٤	٣.٦٧	٣.٥٣	٣.٨٣	٤.٠٣
Mean of A١		٣.٦٣	٣.٨٣	٣.٩٩	٣.٩٨
Strain B(A٢)	B١	٤.٤٧	٤.٣٣	٤.٤٧	٤.٢١
	B٢	٤.١٧	٣.٩٧	٤.٢٠	٥.٤٠
	B٣	٣.٧٧	٣.٥٠	٤.٣٧	٤.١٥
	B٤	٣.٥٠	٣.٥٠	٤.٤٧	٤.٤٥
Mean of A٢		٣.٩٨	٣.٨٣	٤.٣٨	٤.٥٥
Mean of B	B١	٤.٠٥	٤.٠٠	٤.٢٣	٤.٠٨
	B٢	٤.٠٥	٣.٩٧	٤.٤٥	٤.٩٢
	B٣	٣.٥٣	٣.٤٥	٣.٩٠	٣.٨٣
	B٤	٣.٥٨	٣.٥٢	٤.١٥	٤.٢٤
LSD at ٠.٠٥		A: ٠.٠٣ B: ٠.٠٦ AB: ٠.٠٨	A: NS B: ٠.١١ AB: NS	A: ٠.٠١ B: NS AB: ٠.٢٢	A: ٠.٠٥ B: ٠.١٤ AB: NS

B١= ٢٠٠kg potassium sulphate/fed B٢=٣٠٠kg potassium sulphate/fed
B٣= ١.٥ Cm/ L potassium chelate (spray) B٤= ٣ Cm/ L potassium chelate (spray)

Table ٥: Effect of potassium fertilization on Vitamin C of two tomatoes Cvs.grown in between *Khaya senegalensis* trees in ٢٠٠٧ and ٢٠٠٨ seasons.

Treatments Cultivars	Fertilization	Vitamin c mg/ ١٠٠gm ٢٠٠٧	٢٠٠٨
Castle Rock(A١)	B١	١٧.٨٥	١٧.٨٤
	B٢	٢٠.٩٨	٢٠.٩٨
	B٣	١٦.٨٩	١٦.٧٣
	B٤	١٩.٨٩	١٩.٧٠
Mean of A١		١٨.٩٠	١٨.٨١
Strain B(A٢)	B١	١٧.٨٢	١٧.٢٨
	B٢	٢٠.٧٣	٢٠.٦٨
	B٣	١٣.٩١	١٥.٢٨
	B٤	١٩.٤٠	١٨.٧٨
Mean of A٢		١٧.٩٧	١٨.٠١
Mean of B	B١	١٧.٨٣	١٧.٥٧
	B٢	٢٠.٨٦	٢٠.٨٣
	B٣	١٥.٤٠	١٦.٠٠
	B٤	١٩.٦٤	١٩.٢٤
LSD at ٠.٠٥		A: ٠.١٠ B: ٠.١٠ AB: ٠.١٥	A: ٠.١٢ B: ٠.١٦ AB: NS

B١= ٢٠٠kg potassium sulphate/fed B٢=٣٠٠kg potassium sulphate/fed
B٣= ١.٥ Cm/ L potassium chelate (spray) B٤= ٣ Cm/ L potassium chelate (spray)

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Yield and quality of tomato interplant

سلوك نباتات الطماطم النامية كزراعة مختلطة مع الأشجار الخشبية : ١ـ انتاج وجودة ثمار الطماطم

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أجريت هذه الدراسة بالمزرعة الاستوائية بكوم امبو، محافظة أسوان و التابعة لمعهد بحوث البساتين، مركز البحوث الزراعية خلال مواسم ٢٠٠٦/٢٠٠٧ و٢٠٠٧/٢٠٠٨ وذلك بغرض دراسة مقارنة لنمو وانتاج صنفين من الطماطم (كاسل روك ، سترين B) تحت أشجار الكايا السنغالى والتى كان عمرها عند بداية التجربة ٤ سنوات ومنزرعة على مسافة ٣.٥X٣.٥ متر فى نظام الزراعة المختلطة بالغابات. و ذلك لمعرفة مدى نجاح محاصيل الخضر متمثلة فى نباتات الطماطم فى ظروف الأراضى حديثة الاستصلاح.

وقد تم استخدام مستويات من سماد البوتاسيوم : ٢٠٠ كجم كبريتات بوتاسيوم / فدان (كنترول)، ٣٠٠ كجم كبريتات بوتاسيوم/فدان، بوتاسيوم مخلبى(رش) بمعدل ١.٥سم، ٣ سم /لتر على نباتات الطماطم . وقد صممت التجربة فى نظام القطاعات المنشقة وكانت أصناف الطماطم تمثل القطع الرئيسية، بينما كانت مستويات التسميد البوتاسى تمثل القطع المنشقة.

وكان أهم النتائج المتحصل عليها ما يلى :

- **هناك اختلافات معنوية فى انتاج وجودة ثمار أصناف الطماطم نتيجة لاستخدام مستويات التسميد البوتاسى المختلفة .**
- **أدى استخدام المعاملة بمعدل ٣٠٠كجم كبريتات البوتاسيوم /للفدان إلى أفضل نتائج بخصوص فيتامين C ، النسبة المئوية للحموضة المعايرة ، وزن الثمرة ، معامل شكل الثمرة ، المحصول الكلى للفدان ، والنسبة المئوية للمواد الصلبة الذائبة الكلية.**

- تفوق صنف كاسل روك نتيجة لاستخدام السماد البوتاسى تحت الاشجار عن صنف سترين B فى قياسات فيتامين C ، وزن الثمرة ، معامل شكل الثمرة ، المحصول الكلى للفدان .
- أدى استخدام السماد البوتاسى مع صنف سترين B النامية تحت الأشجار إلى قيم مرتفعة بخصوص النسبة المئوية للحموضة المعايرة ، السكريات المختزلة ، عدد الفجوات /ثمرة ، المواد الصلبة الذائبة الكلية .

وبذلك توصى الدراسة بزيادة التوسع فى استخدام نظام الزراعة المختلطة بالغابات Agroforestry والذى يشمل انتاج المحاصيل الزراعية مثل الطماطم وغيرها مع الاشجار الخشبية الهامة إقتصادياً مثل اشجار الكايا السنغالى خاصة فى ظل نقص الموارد فى الانتاج الزراعى بمصر خاصة الانتاج الخشبى وفى ظل الظروف البيئية غير المواتية خاصة فى المناطق حديثة الاستصلاح والتى تعانى من نقص فى الرطوبة النسبية للهواء وارتفاع درجات الحرارة والرياح الضارة فى المناطق المكشوفة . أيضا توصى الدراسة باستخدام صنف كاسل روك مع التسميد بـ ٣٠٠كجم سلفات البوتاسيوم للحصول على أفضل انتاجية و أعلى جودة تحت الظروف المشابهة.