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Research Application Summary

Effect of pruning on yield and quality of selected indeterminate tomato lines

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Abstract

In this study, we investigated the effect of prunning intensity on tomato fruit yield of five introductions and one variety. Tomato line significantly affected all tomato yield components in addition to marketable and non-marketable yield. The number of marketable fruits per hectare was highest in line P20 (319,692) followed by line 186-2 (06) (163,7730). Prunning intensity also influenced all tomato yield components except total fruit yield (t/ha). The number of marketable fruits per hectare was highest in the 2-stem system (136,518) followed by the 3-stem system (135,251), while the least was recorded in the single stem prunning system. Pending wide-scale evaluation of these lines, P20 and 186-2(06) have potential of becoming good varieties in Tanzania.

Key words: *Lycopersicon esculentum*, marketable yield, prunning intensity, yield components

Résumé

Dans cette étude, nous avons étudié l'effet de l'intensité « prunning » sur le rendement des fruits de tomate de cinq introductions et d'une variété. La lignée de tomate a significativement affecté toutes les composantes du rendement de tomates, en plus de rendement commercialisable et non négociables. Le nombre de fruits commercialisables par hectare était plus élevé dans P20 ligne (319 692), suivie par la ligne 186-2 (06) (163,7730). L'intensité Prunning aussi a influencé tous les composantes du rendement de tomate, sauf la production de fruits total (t / ha). Le nombre de fruits commercialisables par hectare est le plus élevé dans le système 2-tige (136 518), suivie par le système 3-tige (135 251), tandis que, le plus faible a été enregistré dans le système de tige unique prunning. Dans l'attente de l'évaluation à grande échelle de ces lignes, P20 et 186-2 (06)
ont un potentiel de devenir de bonnes variétés en Tanzanie.

Mots clés: *Lycopersicon esculentum*, le rendement commercialisable, l'intensité prunning, composantes du rendement

Background

In Tanzania, both determinate and indeterminate tomato (*Lycopersicon esculentum*) are grown. Indeterminate types are normally desuckered (pruned) to single stem while the determinate types are not prunned. New indeterminate tomato varieties have been introduced in Tanzania with an aim of increasing tomato production and consumption. Pruning is reported to increase quantity and quality of tomato. However the efficacy of single stem, double or multiple stem as pruning system under field conditions in Tanzania is not well documented. In addition the response of the different tomato cultivars to pruning system is not known. There is therefore a need to establish an optimal pruning system for enhanced productivity of selected accessions of indeterminate tomato under field conditions.

Literature Summary

Tomato (*Lycopersicon esculentum*) originated from the tropics of Central and South America (Kalloo, 1993), and provides income to growers, expand export while supplying vitamins in human nutrition (Rawshan, 1996). Among the cultivars, flowering habit ranges from highly indeterminate to strongly determinate, and flowers are self-pollinated (Rubatzky, 1996).

Tomato production is higher than for any other fruit and vegetable crop in Tanzania with a total of 129,578 tons per year and represents 51% of total fruit and vegetables crop product (National Sample Census of Agriculture, 2006). Among the constraints that prevent farmers from achieving potential yield are excessive insects and disease damage, unavailability of quality seed, the use of unadapted varieties and the lack of appropriate cultural practices (Villareal, 1980). Davis and Esters (1993) reported that two management practices, which greatly influence tomato yield, are spacing and pruning, especially for indeterminate varieties. Guan and Janes (1991) reported that pruning tomato plants regulate N: CHO ratio within the plant, and enhance fruiting.

Study Description

The study was conducted at Sokoine University of Agriculture (SUA) in Morogoro, from November 2009 to March 2010. The soils of the area are fertile, dark sandy loams with a pH of 7 (Isaac, 2001). Five lines and one variety of indeterminate tomato were used in the study. The tomato lines used were S.178, S.181-1(06), 186-2(07), S175 and P20 Tengeru97 variety was used as a control. In nursery and field experiment, fertilizer (TSP, urea and CAN and pesticides (Ridomil and Karate) were applied. Desuckering was done weekly beginning three weeks of

experiment establishment. The field experiment was a factorial laid in a split plot design with 3 replications. The main factor was tomato lines and sub factor was branching levels. Data were collected at different stages of plant growth. From each plot, central plants were marked and used for data collection on vegetative, reproductive growth parameters and fruit characteristics. The data collected were subjected to analysis of variance (ANOVA) using statistical software COSTAT 6.4 (Cohort Software, Minneapolis, USA). All statistical tests were carried out at 5% level of significance and means separated using Student-Newman-Keuls.

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There were significant ($P<0.05$) tomato line effects for number of days to the first fruiting. Lines 186-2(06) and P20 were earliest to fruit (44th day) followed by S175, S178,181-(01) and Tengeru 97 which fruited at 45, 47, 48 and 51 days after transplanting, respectively. The pruning level did not significantly influence the number of days to the first fruit formation. The number of flowers was very highly influenced ($P<0.001$) by both the lines used and the pruning level. P20 bore the highest number of flowers (71 flowers per plant) followed by Tengeru 97 , 186-(06), S175, S178 and 181-(01) with respectively 44, 45, 45, 40, and 36 flowers per plant. There was a highly significant effect ($P<0.001$) of pruning treatments on the number of flowers per plant with flower numbers reducing from unprunned plants followed by three, two, and single stem pruned plants.

The number of tomato fruits per plant was significantly ($P<0.001$) influenced by the line and the pruning level. However, higher number of fruits per plant was found in P20 line with a mean of 22.84 fruits followed by 186-2(06), S175, S178, Teng 97 and 181-(01) with respectively, 13.84, 11.43, 6.36, 5.59 and 4.47 of fruits per plant. These differences could be attributed to the genetic factors. Differences were also very highly significant ($P<0.001$) in different pruning levels in respect to the total number of fruits per plant. The highest number of fruits per plant was observed in unpruned plants, followed by three stems, two stems and single stem prunned plants with respectively 12.91, 10.72, 9.94,and 9.4 fruits per plant.

Total fruit yield was also significantly influenced by tomato line. Lines 186-2(06) and P20 had the highest yield of 20.64 and 18.81t while variety Tengeru97 had the lowest yield (9.68t per ha). Prunning levels did not influence yield per ha (Tables 1 and 2).

Table1. Mean values of lines effects on total yield and yield components.

Lines	Number of fruits/plant	Number of Flowers/clu	Number of flowers/plant	Fruit set (%)	Weight of single fruit(g)	Total fruit yield(t)/ha	Marketable fruits per ha	Non marketable fruits/ha
P20	22.84a	5.69a	71.38a	35.21a	99.58ab	18.81ab	319,692.46a	138,227.22a
186-2(06)	13.84b	3.62c	44.44bc	34.36a	143.41a	20.64a	163,773.14b	144,097.22a
S175	11.43b	3.75c	44.69bc	30.11a	134.66b	11.95b	83,250.66b	327,738.09b
S178	6.36c	3.78c	40.18bc	16.51b	177.17b	10.12b	56,547.61b	17,278.43b
Teng97	5.59c	4.25b	49.44b	14.00b	121.4b	9.68b	65,806.87b	42,824.07b
181-(01)	4.47c	3.62c	35.88c	13.54b	210.92ab	13.42ab	54,563.49b	23,148.15b
Mean	10.75	4.13	47.73	23.96	147.86	14.11	123,939.04	66385.58
LSD0.05	2.1	0.36	9.16	4.54	24.86	6.23	82698.87	48193
Ftest	***	***	***	***	***	*	***	***
CV (%)	61.97	21.64	36.25	56.97	13.55	27.71	31.98	43.05

Means followed by the same letters(s) within the column are not significant at 5% level based on Student-Newman-Keuls. ns=not significant,*= significant (P< 0.05), **= highly significant(P< 0.01),***= very highly significant (P< 0.001). P20, 186-2(06),S175, S178, 181-(01) are new lines, Ten97= Tengeru 97 is a local variety (control).

Table 2. Mean values of pruning level effects on total yield and yield components.

Pruning treatment	Number of fruits/plant	Number of flower/cluster	Number of flower/plant	Fruit set (%)	Weight of single fruit(g)	Total fruit yield(t)/ha	Marketable fruits per ha	Non marketable fruits/ha
Non pruning	12.91a	3.93b	66.43a	18.84b	126.11b	14.09a	132,716.05a	77,160.49a
Single stem	9.95b	4.37a	31.19c	31.71a	159.89a	12.71a	91,269.84b	49,272.49b
Two stems	9.94b	4.29a	44.64b	22.82b	152.26a	14.83a	136,518.96a	71,318.34ab
Three stems	10.72b	3.94b	48.69b	22.47b	153.18a	14.81a	135,251.32a	67,791.01ab
Mean	10.75	4.13	47.73	23.96	147.86	14.11	123,939.04	66385.58
LSD0.05	1.78	0.24	4.62	3.65	13.54	2.64	26,796.62	19,320.62
Ftest	***	***	***	***	**	ns	**	*
CV(%)	61.97	21.64	36.25	56.97	13.55	27.71	31.98	43.05

Recommendation

From this study, tomato lines 186-(06) and P20 exhibited the highest potential in terms of marketable fruit yield and earliness. These lines respond better to three and two branching compared to no pruning and single stem system. Further studies in diverse agro-ecological zones are however necessary to confirm the performance of these lines and their response to multiple branches.

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