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Impact of mulching and certain pre harvest treatments on growth and yield of mango (*Mangifera indica* L.) cv. ALPHONSO

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ABSTRACT

A field experiment was conducted during 2007-2008 at Horticultural College and Research Institute, Periyakulam with a view to study the growth and yield attributing characters of mango by the treatment combination of mulching with the pre harvest chemical sprays of calcium chloride, calcium nitrate, potassium sulphate and borax along with the bio inoculants which include *Pseudomonas fluorescens* FP7 (0.2%) along with chitin (0.5%) in mango. The treatments include mulching(dried leaves)(T_1),mulching + calcium chloride 2%(T_2), mulching + calcium chloride 4%(T_3),mulching + calcium chloride 6%(T_4),mulching + calcium nitrate 4%(T_5),mulching + potassium sulphate 1%(T_6),mulching + borax 1%(T_7),mulching + *Pseudomonas fluorescens* FP7(0.2%) + chitin (0.5%) 6 times at 15 days interval starting from 15 days before expected flowering + calcium chloride 1%(T_8) and control(without spray and mulching(T_9).The treatment has been given to the experimental orchard 30 days prior to harvest. The results revealed that mulching along with spraying of one per cent potassium sulphate resulted in increased tree height, tree girth and tree spread in east –west and north-south directions, at vegetative, flowering and harvesting stages and earliest fruit harvest at 96 days. Highest number of panicles per square metre, highest fruit set per centage at pea berry stage and highest fruit retention was observed when mulching was done along with spraying of *Psuedomonas fluoroscens* FP7 (0.2%) with chitin(0.5%)and one per cent calcium chloride.

Key words : Mulching, Mango, Bioinoculants, Pre harvest treatment

INTRODUCTION

Fruits are considered as protective and they play a significant role in human diet through the supply of required vitamins and minerals. Among the fruits, mango is one of the best fruit in the world market due to its excellent flavour, attractive fragrance, beautiful colour, delicious taste and health giving properties. Hence, it is popularly called as 'King of fruits'. One medium sized mango of 200 g provides more than daily requirement of Vitamin A of an adult and three fourth requirement of Vitamin C. India continues to be the largest mango producing country of the world, with total production of 140 million tones. The serious threat imposed to the per capita availability of fruits is their perishable nature and consequent post harvest loss stretching to the tune of mango 20-50 per cent of the horticultural produce. Post harvest loss in mango fruits starts from pre harvesting stage followed by harvesting, handling, cleaning, transportation, storage, packing, processing and marketing. The growth and development of the fruit along with its shelf life largely depends upon the initial growth of the plant. Diseases often are the most important constraint to the production of tropical fruit. They indirectly reduce yields by debilitating the plant and directly reduce the yield of fruit before it could be recognized and managed. Dry spells during flowering and early fruit development stages, adversely affect the fruit yield. Therefore, application of mulches on soil surface may be a viable option for better soil health. Hence, pre harvest treatments using chemicals in combination with mulching were applied to study their effect on the growth and yield attributing characters in mango.

MATERIALS AND METHODS

The material of the present investigation consisted of mulching, bio inoculants and chemicals as pre harvest field sprays, for increasing the yield and yield attributing characters in mango (*Mangifera indica* L.) cv. ALPHONSO. The experimental field was raised in a Randomized Block Design with four replications. The chemicals used as pre harvest field spray comprised of calcium chloride 2, 4 and 6 per cent, calcium nitrate 4 per cent, potassium sulphate 1 per cent and borax 1 per cent wherein *Pseudomonas fluorescens* FP7(0.2%) along with chitin (0.5%) were used as bioinoculants. Observations were recorded on various growth characters such as tree height, tree girth and tree spread. The yield attributing characters in the study included fruit set percentage, fruit retention at harvest, number of panicles produced on one square meter canopy area, number of days to harvest from fruit set, individual fruit weight, individual fruit volume, yield per tree and number of fruits per tree. Tree height was measured from the base to the top most growing point using measuring tape and expressed in m. The tree spread was recorded using a measuring tape in both east-west and north-south

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direction and the mean values expressed in m. Number of panicles was counted per square metre area at five different places in a tree with the help of wooden frame of 1m x 1m dimension and the mean was computed and expressed in number. Individual fruit weight was weighed in the balance and the mean fruit weight was computed and expressed in g per fruit. Individual fruit volume was measured by water displacement method and expressed in ml and the yield of fruits harvested in matured stage was computed and the total was expressed in kg per tree. Data collected on these growth and yield attributes were subjected to statistical analysis as per the methods suggested by Panse and Sukhatme(1967).

RESULTS AND DISCUSSION

Mulching and certain pre harvest treatments had significant influence on all the growth parameters at all the stages of tree growth.T_6 recorded the highest tree height of 3.87 m, 4.05 m and 4.11 m at vegetative, flowering and harvesting stages, respectively (Table 1). The plant growth promoting rhizobacteria application was often associated with increased rate of plant growth (Kloepper *et al.,* 1980).The highest tree girth of 56.78 cm,56.84 cm and 56.92 cm was recorded at vegetative, flowering and harvesting stages, respectively by T_6 followed by T_8 which recorded 56.62 cm,56.68 cm and 56.75 cm, respectively. The tree spread in the (East-west directions)was highest 4.63 m,4.70 m and 4.78 m with T_6 recorded at vegetative, flowering and harvesting stages ,respectively followed by T_8.With regard to north – south directions, highest tree spread was recorded in T_6 with the values of 4.74 m,4.80 m and 4.86 m at all the three stages. The positive response of mulching treatments on growth characteristics might be attributed to congenial environment in root zone due to lower weed population, optimum soil moisture level, increased availability of nutrients, favorable soil temperature and increased beneficial microbial population. These results are in conformity with the findings of Srivastava and Agrawal (1965) in strwberry and Borthakur and Bhattacharya (1992) in guava.

The treatment T_8 registered highest number of panicles per square metre 27.45 followed by T_6(24.60).There was a per cent increase in the fruit retention at harvest in T_8 which recorded 57.24 subsequently followed by T_6(53.82)(Table 2).The treatment T_6 recorded less number of days taken for fruit set to fruit harvest(96 days) followed by T_8(98 days).These results were in concurrence with the earlier findings of Vivekananthan *et al.* (2004 and 2006) in mango cv.Neelum

Table 1 : Effect of mulching and certain pre harvest treatments for morphological attributes in mango

Treatments	Tree height(m)			Tree spread East – West directions(m)			Tree spread North – South directions(m)			Tree girth(cm)		
	Vegetative stage	Flowering stage	Harvesting stage	Vegetative stage	Flowering stage	Harvesting stage	Vegetative stage	Flowering stage	Harvesting stage	Vegetative stage	Flowering stage	Harvesting stage
T_1	3.31	3.46	3.55	4.06	4.13	4.20	4.21	4.28	4.35	56.10	56.16	56.20
T_2	3.63	3.79	3.86	4.40	4.49	4.54	4.46	4.54	4.61	56.43	56.47	56.52
T_3	3.56	3.71	3.77	4.46	4.55	4.62	4.54	4.60	4.67	56.51	56.56	56.65
T_4	3.48	3.66	3.74	4.31	4.38	4.44	4.39	4.46	4.52	56.35	56.40	56.47
T_5	3.42	3.60	3.66	4.22	4.29	4.35	4.33	4.40	4.47	56.26	56.31	56.40
T_6	3.87	4.05	4.11	4.63	4.70	4.78	4.74	4.80	4.86	56.78	56.84	56.92
T_7	3.36	3.53	3.60	4.15	4.21	4.27	4.27	4.34	4.40	56.17	56.20	56.28
T_8	3.76	3.92	4.00	4.54	4.63	4.71	4.63	4.69	4.77	56.62	56.68	56.75
T_9	3.19	3.34	3.39	3.97	4.05	4.12	4.10	4.16	4.22	56.02	56.10	56.15
S.E. ±	0.1087	0.1144	0.1171	0.0044	0.0058	0.0023	0.0083	0.0209	0.0133	0.0294	0.0198	0.0099
C.D. (P= 0.05)	0.2242	0.2361	0.2417	0.0091	0.0119	0.0048	0.0171	0.0430	0.0276	0.0607	0.0409	0.0205
C.D. (P=0.01)	0.3056	0.3218	0.3293	0.0125	0.0162	0.0066	0.0234	0.0586	0.0375	0.0827	0.0557	0.0279

Table 2 : Effect of mulching and certain pre harvest treatments for yield parameters in mango

Treatments	Number of panicles per square meter canopy	Fruit set percentage at pea berry stage (%)	Fruit retention at harvest (%)	Number of days from fruit set to fruit harvest	Individual fruit weight (g)	Individual fruit volume (ml)	Number of fruits per tree	Yield per tree (kg)
T_1	16.14	0.27	34.64	107	176.92	169.39	92.0	16.64
T_2	22.57	0.36	47.30	102	273.25	262.03	120.0	32.17
T_3	24.15	0.37	51.46	100	285.41	280.05	125.0	35.26
T_4	20.92	0.34	44.53	102	264.11	253.10	115.0	30.11
T_5	18.25	0.32	42.17	104	250.44	240.78	110.0	26.79
T_6	24.60	0.39	53.82	96	290.27	284.75	132.0	36.82
T_7	16.78	0.30	36.75	106	224.04	219.13	102.0	21.51
T_8	27.45	0.42	57.24	98	314.94	304.97	138.0	43.10
T_9	12.36	0.24	29.87	110	161.66	153.04	86.0	13.32
S.E. $\pm$	0.0115	0.0049	0.4276	0.4404	0.4291	0.5981	0.0251	0.0179
C.D. (P=0.05)	0.0237	0.0102	0.8825	0.9089	0.8857	1.2344	0.0517	0.0370
C.D. (P=0.01)	0.0323	0.0139	1.2026	1.2386	1.2069	1.6821	0.0705	0.0504

and Alphonso, respectively. Ramamoorthy and Samiyappan (2001) reported the role of phytohormones like gibberellins, cytokinins and indole acetic acid in triggering flowering and fruit set after the application of plant growth promoting rhizobacteria. Similarly mulching helped to overcome water stress during panicle development and retention of the fruit, by reducing the competition between the crop and the weed for nutrient there by the nutrient availability was increased to the crop. This is in confirmatory with the results of Kumar *et al.* (1999).

Similarly, significant difference was observed between the treatments for all the yield and yield components (Table 2). The individual fruit weight was highest in T_8 (314.94 g) followed by T_6 (290.27 g).Trees under T_8 harvested more number of fruits 138 followed by T_6 (132).The least number of fruits was recorded in T_9.Also,T_8 recorded superiority over other treatments (43.10 kg) followed by T_6.This may be due to the beneficial effect of mulching which suppresses weed growth, reducing evaporation of soil moisture and minimizing the variation in soil temperature seems to stimulate growth and yield (Vivekanathan *et al.*, 2006 in mango).

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