J. Agrofor. Environ. 2(2): 113-117, 2008 ISSN 1995-6983

Effects of different plant extracts and chemicals on yield and quality of fruits of four mango varieties

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Abstract: The study was conducted at the BAU Germplasm Centre (GPC) of Fruit Tree Improvement Programme (FTIP), Department of Horticulture, Bangladesh Agricultural University (BAU), Mymensingh during March to August, 2007 to investigate the effects of different plant extracts and chemicals on yield and quality of mango. Four varieties of mango viz., Amrapali, Mallika, BAU Aam-1 and BAU Aam-3 were taken under the experiment. Different plant extracts (garlic extract and bishkatali extract) and (boron, Tilt 250 EC) were used as foliar spray. From this study the highest number of fruits plant^{-1} and disease free fruits plant^{-1} were obtained from cv. Amrapali treated with garlic extract. The highest individual fruit weight was obtained from Mollika treated with bishkatali extract and the lowest was found from Amrapali under control. The highest yield (plant^{-1} and ha^{-1}) was recorded from Amrapali treated with garlic extract and the lowest was recorded from BAU Aam-3 in control treatment. On the basis of flesh colour, flavour, sweetness and taste Amrapali was considered to be the best followed by Mallika among the four varieties. Among the different plant extracts performed better than chemicals.
Key words: An extract, bishkatali extract, mango, yield and quality.

Introducción

Mango (*Mangifera indica* L.) is an important and popular fruit of Bangladesh. Mango has got a unique position in respect of nutritional quality, taste and consumers' preference, among about 50 species of fruit crops grown in Bangladesh. In addition, mango is now recognized as one of the best fruits in the world market (Shahjahan *et al.*, 1994). The major problems in mango production are poor and erratic flowering, low fruit set, excessive fruit drop, diseases, alternate bearing etc. (Hossain and Singh, 1988). In Bangladesh 18 mango diseases have been reported. Anthracnose is one of the most important diseases in Bangladesh caused by *Colletotrichum gloeosporioides*. The disease develops on tender twigs, flowers, flower stalks and fruits. In Bangladesh, most of the farmers have no knowledge about the control techniques for the diseases. A few farmers control fruit diseases by applying chemicals but they do not follow the proper rule. Indiscriminate use of the chemicals is not only hazardous to living being but also disrupts the natural ecological balance by killing the beneficial soil microbes (Ansari, 1995). So alternatives have to be developed to control these diseases in order to safe fruit production as well as the environment. The introduction of plant extracts with the aim to reduce or eliminate negative side effects caused by chemicals used for controlling plant diseases are being discouraging all over the world. Garlic extract reduced the incidence of mango anthracnose and resulted higher yield (Chowdhury, 2005). Flavour, texture, appearance, consistency, palatability, nutritional values, safety, ease of handling, convenience, storage ability and packaging are the essential consideration that must be evaluated in establishing a products quality. Considering the above facts the present study was under taken to find out the effects of plant extracts and chemicals on quality fruit production, and to increase the yield.

Materials and Methods

The experiment was carried out at the BAU Germplasm Centre (GPC) of Fruit Tree Improvement Programme (FTIP), Department of Horticulture, BAU, Mymensingh during the period from March to August, 2007. The experimental area was under sub-tropical climate. The experiment consisted of two factors.

Factor A: Variety

The experiment was done on 6 years old mango plants of four varieties viz., i) Amrapali, ii) Mallika, iii) BAU Aam-1 (Sraboni-1), and iv) BAU Aam-3 (Diabetic).

Factor B: Different plant extracts and chemicals

Different plant extracts and chemicals viz., i) Garlic (*Allium sativum*) extract (1:10), ii) Bishkatali (*Polygonum hydropiper*) extract (1:10), iii) Boron (0.2% boric acid) iv) Tilt 250 EC (0.5 ml/L of water) and v) Control (water spray) were used as foliar spray.

All the spray treatments plant extracts and chemicals were applied @ 2 L/plant for two times. First, when the fruits attained at pea size; second, 10 days after the first application. The experiment was laid out in Randomized Complete Block Design (RCBD) with 3 replications. The total number of plants were 4 × 5 × 3 = 60, one plant considered as an individual

replication. Planting was in hexagonal system giving spacing of 3 m. Data on the following parameters were recorded from all the experimental plants after harvesting of fruits-total number of fruits plant^{-1}, number of disease free fruits plant^{-1}, number of diseased fruits plant^{-1}, percentage of disease free and diseased fruits plant^{-1}, total weight of fruits plant^{-1}(kg), weight of individual fruit (g), yield of disease free fruit plant^{-1}(kg) and tha^{-1}. After ripening of fruits flesh colour, flavour, sweetness and taste were determined by a pannel of judges and expressed in language. The recorded data on different parameters were analyzed statistically using MSTAT computer package programme.

Results and Discussion

Effect of varietal differences

Significant variation was found among the varieties in all studies parameters (table 1). The height number of fruits plant^{-1} (60.87), and yield (11.48 tha^{-1}) were found in the verity Amrapali followed by Mallika (22.87, 10.24tha^{-1}), BAUAam-1 (20.80, 8.16 tha^{-1}) and lowest in BAU Aam-3 (19.60, 6.66 tha^{-1}). Highest number of disease free fruits plant^{-1} (85.27%) also found in Amrapali and statiscally similar diseases free fruits plant^{-1} was observed other three verities (Table 1).

Table 1 Effect of varietal differences on yield and quality of mango

Variety	No. of fruits/plant	Disease free fruits/plant (%)	Diseased fruits/plant (%)	wt. of fruits/plant (kg)	Individual fruit wt. (g)	Yield of disease free fruits/plant (kg)	Yield of disease free fruits (t/ha)
Amrapali	60.87	89.27	10.73	10.28	168.80	9.23	11.48
Mallika	22.87	85.96	14.03	9.45	417.59	8.23	10.24
BAU Aam-1	20.80	86.78	13.22	7.59	362.49	6.55	8.16
BAU Aam-3	19.60	86.32	13.69	6.17	314.19	5.35	6.66
LSD (0.01)	2.299	1.777	1.705	0.713	17.582	0.622	0.773
Level of significance	**	**	**	**	**	**	**

** Significant at 0.01 level of probability

Table 2 Effect of different plant extracts and chemicals on yield and quality of mango

Plant extracts and chemicals	Total no. of fruits/plant	Disease free fruits/plant (%)	Diseased fruits/plant (%)	Total wt. of fruits/plant (kg)	Individual fruit wt. (g)	Yield of disease free fruits/plant (kg)	Yield of disease free fruits (t/ha)
Garlic extract	37.92	90.51	9.49	10.13	316.31	9.17	11.42
Bishkalati extract	32.08	88.82	11.18	8.84	320.38	7.99	9.94
Boron	33.00	86.62	13.38	8.85	315.88	7.69	9.58
Tilt 250EC	28.25	87.62	12.37	7.61	313.57	6.63	8.26
Control	23.92	81.84	18.16	6.43	312.07	5.19	6.47
LSD (0.01)	2.57	1.987	1.906	0.797	-	0.695	0.864
Level of significance	**	**	**	**	NS	**	**

** Significant at 0.01 level of probability; NS Not significant

Effect of plant extracts and chemicals

The effect of different plant extracts and chemicals in relation to total number of fruits per plant, number and percentage of disease free fruits per plant, number and percentage of diseased fruits per plant, total weight of fruits per plant, yield of disease free fruits per plant and per hectare (Table 2). The maximum number of fruits was found in garlic extract treated plant (37.92) followed by boron (33.00) and the minimum was found in control plant (23.92). These results might be due to the fact that garlic extracts reduced fruit infection, which led to decrease the number of fruit drop per plant. The results are similar with the findings of Chowdhury (2005), who reported that foliar application of garlic extract increased number of fruit retention. The highest number of disease free fruits per plant was recorded in garlic extract treated plant (34.50) followed by boron

(28.92) and the lowest was found in control plant (19.83). The results indicated that plant extracts and chemicals inhibited the fruit infection and thus increased number of disease free fruits per plant. The highest percentage of disease free fruits per plant was recorded from garlic extract treated plant (90.51) and the lowest was in control plant (81.84).

Table 3 Combined effects among different varieties and plant extracts and chemicals on yield and quality of Mango

Variety × plant extracts and chemicals		Total no. of fruits/plant	Disease free fruits/plant (%)	Diseased fruits/plant (%)	Total wt. of fruits/plant (kg)	Individual fruit wt. (g)	Yield of disease free fruits/plant (kg)	Yield of disease free fruits (t/ha)
Amrapali	Garlic	76.00	92.11	7.89	12.51	164.87	11.52	14.34
	Bishkatali	60.33	91.75	8.26	10.55	175.17	9.69	12.06
	Boron	66.67	89.52	10.48	11.61	174.37	10.40	12.95
	Tilt 250 EC	54.33	87.81	12.19	9.18	169.23	8.04	10.04
	Control	47.00	85.15	14.85	7.54	160.37	6.41	7.99
Mallika	Garlic	27.67	89.29	10.71	11.67	418.43	10.34	12.87
	Bishkatali	26.33	87.39	12.61	10.80	432.17	9.91	12.34
	Boron	22.33	85.12	14.88	9.16	408.97	7.79	9.70
	Tilt 250 EC	20.67	87.18	12.82	8.56	415. 87	7.33	9.13
	Control	17.33	80.85	19.15	7.13	412.53	5.76	7.17
BAU Aam-1	Garlic	24.67	90.59	9.41	8.89	364.03	8.13	10.13
	Bishkatali	21.00	87.38	12.62	7.49	358.93	6.57	8.19
	Boron	22.67	86.63	13.37	8.23	364.77	7.12	8.87
	Tilt 250 EC	19.33	87.90	12.10	6.86	356.00	6.04	7.52
	Control	16.33	81.42	18.58	6.38	368.73	4.89	6.08
BAU Aam-3	Garlic	23.33	90.05	9.95	7.42	317.90	6.67	8.31
	Bishkatali	20.67	88.77	11.23	6.51	315.27	5.78	7.13
	Boron	20.33	85.21	14.81	6.42	315.43	5.47	6.81
	Tilt 250 EC	18.67	87.61	12.39	5.84	313.17	5.11	6.36
	Control	15.00	79.94	20.06	4.65	309.17	3.72	4.63
LSD (0.01)		5.140	3.973	3.812	1.594	39.315	1.390	1.729
Levels of significance		**	**	**	**	**	**	**

Effect of plant extracts and chemicals

The effect of different plant extracts and chemicals in relation to total number of fruits per plant, number and percentage of disease free fruits per plant, number and percentage of diseased fruits per plant, total weight of fruits per plant, yield of disease free fruits per plant and per hectare (Table 2). The maximum number of fruits was found in garlic extract treated plant (37.92) followed by boron (33.00) and the minimum was found in control plant (23.92). These results might be due to the fact that garlic extracts reduced fruit infection, which led to decrease the number of fruit drop per plant. The results are similar with the findings of Chowdhury (2005), who reported that foliar application of garlic extract increased number of fruit retention. The highest number of disease free fruits per plant was recorded in garlic extract treated plant (34.50) followed by boron (28.92) and the lowest was found in control plant (19.83). The results indicated that plant extracts and chemicals inhibited the fruit infection and thus increased number of disease free fruits per plant. The highest percentage of disease free fruits per plant was recorded from garlic extract treated plant (90.51) and the lowest was in control plant (81.84). The maximum number of diseased fruits per plant was recorded from the control plant (4.08) and the minimum was recorded from bishkatali extract treated plant (3.33). These results might be due to inhibition of fruit infection by bishkatali extract. The highest percentage of diseased fruits per plant was observed in control plant (18.16) followed by boron (13.37) and the lowest was found in garlic extract treated plant (9.49). The obtained results are similar with the findings of Chowdhury (2005), who reported that foliar application of garlic extract on mango inhibited fruit infection. The maximum weight of total fruits per plant was recorded in garlic extracted treated plant (10.13 kg) and the minimum was recorded in the control plant (6.43 kg). The highest yield of disease free fruits per plant was recorded in garlic extract treated plant (9.17 kg) followed by bishkatali extract (7.99 kg) and the lowest was in control (5.19 kg). The results indicated that garlic extract treated plants gave the highest number of disease free fruits per plant which led to the highest yield per plant. The highest yield per hectare was obtained from garlic extract treated plant (11.42 t) followed by bishkatali extract (9.94 t) and the lowest was found in control treatment (6.47 t). The results are found similar with the findings of

Chowdhury (2005), who reported that highest yield of mango was obtained from garlic extract treated plant followed by bishkatali extract. Different plant extracts and chemicals showed non-significant effect on individual fruit weight. However, the highest individual fruit weight was obtained from bishkatali extract treated plant (320.38 g) and the lowest was found in control (312.07 g). On the basis of flesh colour, flavour, sweetness and taste garlic extract treatment was the best followed by bishkatali extract.

Combined effect among different varieties and plant extracts and chemicals

The combined effect of different varieties and plant extracts and chemicals showed significant variation in respect to total number of fruits,number and percentage of disease free fruits per plant, number and percentage of diseased fruits per plant, total weight of fruits per plant, weight of individual fruit, yield of disease free fruits per plant and per hectare (Table 3). The highest number of fruits per plant was observed in Amrapali (76.00) treated with garlic extract and the lowest was in BAU Aam-3 (15.00) in control plant. The highest number of disease free fruits per plant was obtained from Amrapali (70.00) treated with garlic extract and the lowest was from BAU Aam-3 (12.00) under control. The highest percentage of disease free fruits was obtained from Amrapali (92.11) sprayed with garlic extract followed by bishkatali extract (91.74) under control. The highest number of diseased fruits per plant was obtained from Amrapali (7.00) treated with boron and the lowest was from BAU Aam-1 (2.33) treated with garlic extract and Tilt 250 EC. The highest percentage of diseased fruits was observed in BAU Aam-3 (20.06) under control treatment and the lowest was in Amrapali (7.89) treated with garlic extract. The maximum weight of total fruits per plant was found in the variety Amrapali (12.51 kg) treated with garlic extract followed by Mallika (11.67 kg) treated with the same treatment and the minimum was recorded from BAU Aam-3 (4.65 kg) in the control plant. The highest individual fruit weight was recorded in Mallika (432.17 g) treated with bishkatali extract and the lowest was found in Amrapali (160.37 g) under control treatment. The highest yield of disease free fruits per plant was recorded from Amrapali (11.52 kg) in which garlic extract was applied followed by the same variety (10.40 kg) treated with boron and the lowest was found in control plant of BAU Ama-3 (3.72 kg). The highest yield per hectare was obtained from Amrapali (14.34 t) treated with garlic extract and the lowest was recorded from BAU Aam-3 (4.63 t) in control plant.

Wide variations were observed in different mango varieties in respect of flesh colour, flavour, sweetness and taste as influenced by different plant extracts and chemicals. Orange flesh colour was observed in Amrapali and BAU Aam-1 treated with garlic extract and bishkatali extract. Deep yellow flesh colour was observed in Mallika treated with bishkatali and in BAU Aam-3 treated with garlic extract. Pale yellow flesh colour was found in BAU Aam-3 treated with Tilt 250 EC and control. Excellent flavour was observed in Amrapali treated with garlic extract and in Mallika treated with bishkatali extract. Moderate flavour was found in BAU Aam-3 treated with Tilt 250 EC and control. Very sweet was observed in Amrapali, Mallika and BAU Aam-1 treated with garlic extract. On the other hand, moderate sweetness was found in BAU Aam-1 and BAU Aam-3 treated with Tilt 250 EC and control.

From the above results and discussion it can be concluded that among four varieties Amrapali was found to be the best in respect of yield and quality, Mallika also produced higher yield, when both the varieties were sprayed with garlic extract. Among the plant extracts and chemicals, garlic extract was the best followed by bishkatali extract. Boron and Tilt 250 EC also showed better performance than the control.

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