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An Integrated Approach for Guava Wilt Control

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Four varieties of guava (*Psidium guajava*) plants were treated against wilting. Integrated cultural practices and chemical measures for control of wilting were comparatively evaluated. Manuring with N, P, K and $ZnSO_4$, pruning of wilted twigs, bandaging wounds with Ridomil paste and drenching of rhizosphere soils with nematicide were found to be the best among the treatments given. Continuous treatments at 15 days interval helped in survival of the plants, which shot new leaves and shoots after 8-9 months. Deshipeyara were well protected with these treatments than vars. viz. Kazipeyara, Sarupkatti and Mukundhupuri. Integrated method of control arrested the wilting of young guava plants.

Key words: Guava wilt, Integrated control.

Introduction

In Bangladesh wilt is a serious problem for guava plantation. The cause, etiology and varietal reaction of guava plants to wilting, a pre-requisite to proceed for developing any control measure have been determined (Meah and Mamun 1991; Meah 1992& 93; Meah and Ansari 1994). Preliminary investigation revealed that cultural practices or chemical measures alone are not effective enough to combat the problem (Meah 1993; Metha 1987).

It is envisaged that an integration of both the control approaches might yield positive results. The present experiments are therefore, designed to see the effects of an integrated approach against guava wilt.

Materials and Methods

Guava saplings of 4 vars. viz. Kazipeyara, Sarupkatti, Mukundhupuri and Deshipeyara aged 1-2 1/2 years were collected from Horticulture Centre, Keyotkhali, Mymensingh, Bangladesh. Six plants each of 3 guava vars. Kazipeyara, Sarupkatti and Deshipeyara available at the Bangladesh Agricultural University Campus, Mymensingh, Bangladesh were used.

The plants showing die-back/wilting were given the following treatments: (i) Cultural practices: Pruning, watering at tree base, (a) manuring (Urea, TSP, MP), (b) soil amendments (Mustard cake, rice straw, sawdust, rice polish, ash, MP, urea), (ii) Chemical control: Liming $Ca(OH)_2$, soil application of nematicide [Miral: Isozphics = 0-(5-chloro-1-isoprophyle-1, 1, 2,4-tryazol-3-el) O, 0-dicthyl, phosphoarothiote], bactericide [Sepnil: Chlorhexidines gluconate 0.3% + cetrimide 3%] and fungicide [Ridomil: Mancozeb + Metalaxyl, a.i. 72%], foliar spray of fungicide and bandaging wounds with fungicide paste (iii) Integrated approach: Integration of cultural practices and chemical control (as shown in Table 2).

In case of first experiment, soil pots (mixture of sandy loam soil and cowdung by 50:50) were prepared and saplings were planted. After 15 days, a seven day old culture of *Fusarium oxysporum* f.sp. *psidii* was mixed with rhizosphere soil of guava seedlings in pot @ 0.5% (w/w). Nematode larvae approx. 100-150 (*Helicotylenchus dihystera* and *Hoplolaimus indicus)* were poured per seedling into the holes (4 each of 1 cm dia and 10 cm depth) made with a glass rod around the base of the seedlings. The seedlings were inoculated with the fungus and nematodes separately and in various combinations (Fungus + Nematode 1, Fungus + Nematode 2, Nematode 1 + Nematode 2, Fungus + Nematode 1 + Nematode 2). After 60 days of inoculation, wilted plants, soil pots were treated with soil amendments like mustard oil cake (MOC), rice straw, sawdust, rice polish, ash, muriate of potash (MP) and urea used at the rate of 200g, 250g, 200g, 200g, 200g, 12g, 12g respectively. The experiment was carried out in a randomized complete block design with 3 replications. A similar number of plants were left untreated which served as control.

In case of second experiment, dead parts of the wilted guava plants were pruned off, wounds were treated with fungicide paste (Ridomil : water = 20 g : 10 ml), the foliage was sprayed with fungicide suspension (Ridomil 0.2%) and/or zinc sulphate-lime solution. Rhizosphere soils of the affected plants were amended with lime 1 kg $tree^{-1}$, $ZnSO_4$ (134-135 g $tree^{-1}$), fertilizers (NPK @ 100, 100 and 200g respectively), nematicide (Miral 10-20 g $plant^{-1}$) and bactericide (Sepnil 0.3%, 2 litres $tree^{-1}$). Weekly observations on leaf withering, twig dying and finally complete wilting were made. Along with

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these, observations were made for the initiation of new leaves and shoots.

Results and Discussion

Guava saplings aged 1-2 1/2 years exhibited symptoms of wilting approximately 2 months after inoculation. Among the treatments N enhanced wilting while K minimised the effects of N conducive to pathogen indicated in the retardation of leaf withering (Table 1). The experimental results have corroboration with previous findings of (Meah 1992), opinion of (Mehta 1987 and Sadasivan 1961) who found that wilting could be stopped for a while with increase of soil pH by liming and high potassium supply to soil.

Rice straw and rice polish did not help in arresting guava wilt, while application of ash was more effective than those two (Table 1). Addition of mustardcake and sawdust slowed down wilting which is supported by the observation of (Bhattacharya *et al*1989).

Table 1

Percent wilting of guava saplings due to inoculation of wilt pathogen(s) and its recovery through soil amendments

(A) Wilting and Regeneration after Treatments		
Treatments	% Wilting (withering)	% Regeneration
T_1	19.55	17.71
T_2	8.17	6.67
T_3	8.77	4.71
T_4	21.64	12.60
T_5	26.90	24.64
T_6	57.19	30.60
T_7	12.02	2.01
T_8 (Control)	0.00	0.80
L.S.D.	22.80	8.06
P=0.05/0.01	0.01	0.01
(B) Wilting and Regeneration (Varietal Responses)		
Varieties		
Kazipeyara	18.29	10.16
Sharupkatti	22.39	13.89
Mukundhupuri	23.43	7.18
Deshipeyara	13.00	18.63
L.S.D.	NS	6.88
P=0.05/0.01	--	0.01

In case of wilting: T_1, *Fusarium oxysporum* f.sp. *psidii*. T_2, N_1, *Helicotylenchus dihystera*. T_3, N_2, *Hoplolaimus indicus*. T_4, T_1+N_1. T_5, T_1+N_2. T_6. $T_1+N_1+N_2$. T_7. N_1+N_2 and T_8 Non-inoculated (control). In case of regeneration: T_1, Mustard oil cake. T_2, Rice straw. T_3, Sawdust. T_4, Rice polish. T_5, Ash, T_6, Muriate of potash. T_7, Urea and T_8, Untreated (control).

Effect of various treatments on the incidence and severity of guava wilt have been presented in Table 2. Of the 28 plants receiving various treatments, only 4 plants survived. These were the plants which received first treatment at the initial stage wilting (10-20%). They were given continuous treatments at 15 days interval. The plants survived the wilting and produced new leaves and shoots after 8-9 months of treatments.

Among the other treatments, only manuring (Urea, TSP, MP) could not stopped wilt, although it appeared that manuring a wilting plant retarded the rate of wilt. The retardation in wilting was increased with liming $Ca(OH)_2$ or addition of $ZnSO_4$ in soil and further improved the situation with $ZnSO_4$ spray (Table 2). Manuring improved the health situation of a diseased plant which retarded the wilting rate; it was especially true for a higher dose of potassium (Meah 1992). Potassium discouraged invasion of root by *Fusarium oxysporum* f.sp. *psidii* through diminution of non-protein-nitrogen (NPN) in the trachea (Sadasivan 1961). Liming increased soil pH, thus discouraging the activities of *Fusarium* and consequently retarded wilting rate. This is supported by the findings of (Mehta 1987; Meah and Mamun 1991).

Application of zinc to the soil or foliar spray arrested the wilt and in some cases wilting was halted for a considerable period indicating the association of guava wilt with zinc deficiency (Raychoudhuri 1961). Useful application of nematicide (Miral) was effective which indicates the invariable association of nematode with *Fusarium* in root infection. Association of any bacteria in wilting can not be ruled out as there was some positive action of bactericide (spnil) when applied to sil.

Application of systemic fungicide (Ridomil) as both wound-paste and foliar spray stopped wilting and helped in regeneration of the plants (Table 2). The wilt fungus *Fusarium* was demonstrated to be systemic travers pathogen as destroying the vascular system (Meah and Mamun 1991). The systemic action of the fungicide might have acted upon the fungus on its way for forward and killed it on contact.

Seasonal and varietal effects on guava wilting is presented in Table 3. In wet season (June-October) death of a plant due to wilting was quicker than that of dry season (November-May). Among the vars. Kazipeyara responded least to the treatments when all 6 plants were killed. Out of 12 Sarupkatti plants, 1 was saved. Three out of 10 Deshipeyara plants were protected from wilt (Table 3). (Bhattacharya *et al.* 1989) have reported that wilting varies with guava varieties.

Table 2
Effects of various treatments on the incidence and severity of guava wilting

Treatments	No. of plants treated	Condition of the plants (% wilted)		Time required for recovery or death (month)	Status of treated plants
		Pre-treatment	Post-treatment		
A. Untreated	2	20	Killed	1	--
B. Manuring	3	20	Killed	2	--
C. Manuring + Liming	3	10-20	Killed	3	--
D. Manuring + $ZnSO_4$	2	20	Killed	3	--
E. Manuring+Liming+$ZnSO_4$	3	10	Killed	5	--
F. Manuring + Liming + $ZnSO_4$ + Zn spray	2	20	Killed	5	--
G. Manuring+Liming+$ZnSO_4$ +Zn spray+Fungicide spray	3	10	Killed	5	--
H. Manuring+Liming+$ZnSO_4$ +Zn spray+Fungicide spray Nematicide	3	20	1/2 killed 2 killed	9	Regeneration of wilted portion
I. Manuring+Liming+$ZnSO_4$ +Zn spray+Bactericide	2	15	Killed	4	--
J. Manuring+Liming+$ZnSO_4$ +Zn spray+Fungicide spray Bactericide	2	15-20	Killed	4	--
K. Manuring+Liming+$ZnSO_4$ +Zn spray+Fungicide spray Bactericide + Nematicide + Fungicide paste	3	10	Healthy	8	Produced new leaves & shoots

Manuring: Urea, TSP, MP @ 100, 100 and 200 g respectively per tree, Liming (1 kg $tree^{-1}$), $ZnSO_4$ (134-345 g $tree^{-1}$), Fungicide (Ridomil, 0.2%), Bactericide (Sepnil, 0.2%), Nematicide (Miral, 10-20 g $tree^{-1}$).

Table 3
Seasonal and varietal effects of treatments on guava wilt

Varieties	No. of trees treated	Season	Death		Plants regenerated	
			%	Time taken (months)	%	Time taken(months)
Kazipeyara	6	Wet	100	1-2	--	--
		Dry	"	2-3	--	--
Sarupkatti	12	Wet	91.7	2-3	--	--
		Dry	"	4-5	8.3	4-6
Deshipeyara	10	Wet	70.0	3-4	30	8-9
		Dry	"	6-9		4-6

Based on the above results, it may be concluded that all guava varieties were susceptible to wilting more in wet season that that of dry season. Deshipeyara plants recovered better with recovery treatments than others. None of the control measure singly could stop wilt whereas integrated approach of the control measures were excellent.

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