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Short Communication

On farm testing of biological and chemical measures of fungal wilt management in bottle gourd

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Many times, a single problem creates greater hazard to the crop production, livelihood and income generation. Almost two decades earlier farmers of Jharkhand used to practice complete monoculture, rice in low and medium lands and maize, pigeonpea, sesame, blackgram etc. in uplands. After *kharif* crops, field was rendered fallow for the next *kharif*. This practice is still in custom on an extensive area. With the availability of irrigation facilities, a section of farmers turned vegetable growers. Under the irrigated lands, they use to grow up to three crops of seasonal vegetables. Such intensive cultivation enabled income, employment and livelihood generation among the resource poor small and marginal farmers. As a result of intensive vegetable cultivation particularly in the villages adjacent to the towns and markets, knowingly or unknowingly, the farmers started cultivation of same or related crops year after year in the same field leading to huge build up of diseases and pests in the soil. Similar casuality has been seen with bottle gourd in Garhwa district of Jharkhand. The bottle gourd (*Lagenaria siceraria* L.) has been known to play important role in the economics of vegetable growers of the region but heavy inoculums build up of *Fusarium oxysporum* f. sp. *lagenariae* (Matuo & Yamamoto 1957) owing to continuous cultivation of this crop in the same field and inadequate management measures has resulted in almost complete failure of the crop. This fungus is supposed to be more severe in acidic soil with pH ranging from 4.5 to 6.5. The crop is affected at two stages of growth; first at seedling stage of 2-4 true leaf stage and second at flowering and fruiting stage. In the view of wide range of form specialis of wilt causing fungus, the management practices should also have a wide range of effects and easy accessability to the growers. Apart from chemical control, biological control measures are also proved to be effective for management of wilt caused by *Fusarium oxysporum* (Singh *et al.,* 1999). Therefore, both types of management practices should be tested.

The experiments were conducted during *summer* (March to June), 2008 &2012 in the wilt affected fields of twenty different farmers of Garhwa district falling in rainfed plateaus of Jharkhand (latitude between 23˚34'11" and 24˚32'05", longitude between 83˚10'13" and 83˚56'38" and altitude 350 m above msl) in each year. Soils of experimental plots of 750 m^2 area of each farmer were moderately acidic (pH5.5-6.0) and organic matter content varied from 0.7 to 0.8%. The treatment included three practices. The detailed description of treatments is as follows:

(i) Technology Option (TO-1): Spray of carbendazim 50% WP @ 0.1% as farmers' practice (FP)

(ii) TO-2: Application of *Trichoderma viriae* as seed treatment @ 10 g per kg seed and soil application of the same @ rate of 2.5 kg per hectare before sowing.

(iii) TO3: Application of carbendazim 50% WP as seed treatment @ 2.5 g per kg seed followed by drenching at 0.2% solution twice at two to four-true leaf stage and flowering.

All the three treatments were tested by growing each in plots of 250 m^2 of twenty farmers' field in randomized block design. Data were recorded on mortality of the plants in seedling stage (%), mortality of the plants at flowering stage (%), Fruit yield (q/ha), percentage increase in yield over farmer practice and B:C ratio.

The data depicted in Table 1 indicated that maximum mortality of plants in seedling as well as flowering stage occurred when the crop was only sprayed with carbendazim @0.05%) (10.15% & 22.0% in seedling

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Table 1: Effect of different treatments on incidence of *Fusarium* wilt, fruit yield and economics of bottle gourd pooled of two years

Treatment	Technology Assessed	Mortality of the plants in seedling stage (%)		Mortality of the plants at flowering stage (%)		Fruit yield (q/ha)		Percent increase in yield over farmer practice		B:C Ratio	
		Ist Year	IInd Year	Ist Year	IInd Year	Ist Year	IInd Year	Ist Year	IInd Year	Ist Year	IInd Year
TO1	Farmers Practices (One spray of carbendazim @ 0.1%)	10.15	22.0	11.78	16.0	118.05	105.40	--	--	2.5	2.5
TO2	Seed treatment with *Trichoderma viride* @ 10 g per kg seed along with soil application of the same @ 2.5 kg / ha before seed sowing.	3.88	9.0	3.65	6.0	143.63	135.60	21.67	28.65	3.1	3.3
TO3	Seed treatment with carbendazim @ 2.5 g per kg seed followed by post emergence soil drenching of 0.2 % solution of the same twice at seedling stage and flowering.	1.08	2.0	1.73	3.0	161.88	148.80	37.13	41.18	3.5	3.8
	CV (%)	18.0	16.0	16.90	13.50	6.49	9.40	-	-	-	-
	CD (0.05)	1.33	2.65	0.96	1.28	4.07	5.20	-	-	-	-

stage, 11.78% & 16.0% in flowering stage in first year and second year, respectively). Drastic decrease in the incidence of wilt disease occurred due to seed treatment and two drenching with carbendazim 50% WP (TO3) viz., 1.08% & 2.0% in seedling stage and 0.96% & 1.28% in flowering stage in first year second year, respectively. Fruit yield was found to be negatively correlated with percentage mortality of plants due to wilt. Maximum fruit was observed in the plots treated with TO3 (161.88 q/ha in first year and 148.80 q/ha in second year. Application of *Trichoderma viride* in the form of seed treatment and soil application has also exhibited accountable effect on wilt incidence in terms of mortality of plants in seedling stage (3.88% & 9.0%) and flowering stage (3.65% & 6.0%) and fruit yield (143.63 q/ha and 135.60 q/ha) in both years. Because of higher mortality of plants in farmers' practice (TO1), fruit yield significantly reduced to 118.05 q/ha in the first year and 105.40 q/ha in the second year. With *Trichoderma viride* (TO2), there was an increase in fruit yield by 21.67% and 28.65% over TO1 in the first year and the second year, respectively. This rise in fruit yield reached to 37.13% and 41.18% over farmers' practice in two years of experiments. This is evident that almost 40 % losses in yield occurs if proper control measures are not adopted. Whereas, maximum benefit-cost ratio was also observed in TO3 (3.5 in the first year & 3.8 in the second year) followed by TO2 (3.1 in the first year & 3.3 in the second year), it remained constant ((TO1:2.5). From the results described above, this fact is evident that seed treatment along with soil drenching of carbendazim is more effective treatment for management of wilt caused by *Fusarium* in bottle gourd as compared to foliar spray this is likely because of the fact that comparatively less quantity of carbendazim is supplied in the plant system in the later case. Seed treatment and soil drenching give full control over inoculum which is likely to spread through seeds and soil. Moreover, the pathogen inoculum present in the rhizosphere is destroyed by drenching of carbendazim. Bioagents like *Trichoderma viride* and biofertilizers both proliferate over the organic content of the soil upto an extent called threshold level to show the antagonistic effect upon the invading fungal mycelia. The whole mechanism of proliferation of bioagent mycelium and antagonistic effect takes sufficient time to take place and is affected by several abiotic factors like organic content of soil, temperature, soil moisture and strength of culture applied. which might be probable reason of comparatively low competence of *Trichoderma viride* in controlling *Fusarium* wilt over chemical control. This is concluded based on the discussion that seed treatment with carbendazim 50% WP along with soil drenching of the same at 0.2% twice at 2-4 true leaf stage and flowering gives best control of wilt in bottle gourd during summer season in acidic soil of plateaus of Jharkhand. In view of easy availability, financial affordability and socio-economic feasibility this treatment could be recommended to resource poor small and marginal vegetable growers of Jharkhand for raising their profit from bottle gourd cultivation during summer season.

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