J Krishi Vigyan 2019, 8 (1) : 170-173 DOI : 10.5958/2349-4433.2019.00091.6

Integrated Management of Nematode Disease Complex in Tuberose (*Polianthes tuberose* L)

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ABSTRACT

The present study on management practices for control of nematode disease complex was conducted by ICAR- Krishi Vigyan Kendra, Thirupathisaram in *Kharif* season during 2018-19 at 10 farmers fields in Thovalai block of Kanyakumari district on an area of 4 ha comprising 0.4ha each. Integrated management practices were bulb treatment @ 20 g/kg of bulb each with *Paecilomyces lilacinus* + *Trichoderma viride* + *Pseudomonas fluorescens* , followed by soil application with *P lilacinus* + *T viride* + *P fluorescens* @ 5 kg/ha enriched with FYM (1t) on 30th day after planting followed by foliar application of *P lilacinus* + *T viride* + *P fluorescens* at 30 d intervals @ 5g/ l on 60, 90 and 120th day after planting was demonstrated in farmers field for the management of nematode disease complex. The results revealed 55.8 percent reduction in root knot nematode incidence and 75 per cent reduction in wilt incidence in tuberose in demo fields compared to farmers practice. 20.97 per cent increase in the yield was recorded in demonstration plots and the quality of flowers was better in demonstration plots.

Key Words: Front line demonstration, Tuberose, Root knot nematode, Fungal wilt.

INTRODUCTION

Tuberose (*Polianthes tuberose* L.) is a perennial bulbous flower crop cultivated for its fragrant flowers used in cosmetic industries and for garlands and bouquets. It is an important flower crop of Kanyakumari district grown in an area of 75ha and single type is cultivated for loose flower production especially for garlands making. Vegetative propagation of bulbs paves way for the entry of many pathogens. Among them, plant parasitic nematodes and wilt inducing fungus (*Fusarium* sp.) contribute for the drastic reduction in the plant yield. Infestation of root knot nematode (*Meloidogyne incognita*) was reported to be wide spread in almost all the tuberose growing regions of South India (Rao *et al*, 2001) and known to cause about 10 per cent reduction in the flower yield. Presence of root knot nematode accelerates the wilt development which results in the reduced growth and yield of the crop. Maximum yield reduction was observed when both the nematode and fungal pathogens were present. Naznin *et al* (2015) reported that usage of *Trichoderma* had a positive impact on growth and yield of tuberose and increased the uptake and translocation of less-available minerals. The effect of *Trichoderma* spp. on growth of tuberose and its ability to control stem rot disease caused by *Rhizoctonia solani* was investigated earlier by Mazhabi (2010). High cost of chemicals involved for the management of disease complex provided with their ill effects on the environment made an urge to search for the alternative and reliable eco friendly management strategy for the management of fungal nematode disease complex to make the crop remunerative. Application of bioagents paves a potential candidate for the management of nematodes and fungus infesting various crops. Present study was conducted to demonstrate the effect of integrated management practices for control of nematode disease complex under field condition.

MATERIALS AND METHODS

Front line demonstrations were conducted under rainfed farming situations during *Kharif*

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season of 2018-19 in two different villages namely; Shenbagaramanpudur and Madhavalayam of Thovalai block of Kanyakumari district. The area under each demonstration was 0.4 ha. The soil was sandy loam in texture with moderate water holding capacity. The soil test analysis of the demonstration fields showed the fertility status as low in organic carbon (0.11-0.50%) and available nitrogen (123-192 kg/ha), low to medium in available phosphorus (7.0-14.0 kg/ha) and available potassium (67-231 kg/ha) and soil pH was slightly acidic to neutral in reaction (5.5-7.5).

Before conducting the front line demonstrations, trainings were imparted to the beneficiaries for applying integrated crop management practices in tuberose. The ICM practices (T_1) *viz.,* basal application of farm yard manure and phosphorus, bulb treatment with *Paecilomyces lilacinus* + *Trichoderma viride* + *Pseudomonas fluorescens* @ 20 g/kg of bulb, application of recommended dose of fertilizers@ 200:200:200 NPK kg/ ha, application of neem cake 250 kg/ha, soil application *P lilacinus* + *T viride* + *P fluorescens* @ 5 kg/ha enriched with FYM (1t) on 30th day after planting followed by foliar application of *P lilacinus* + *T viride* + *P fluorescens* each @ 5g/ lit on 60, 90 and 120th day after planting was demonstrated in addition to all improved ICM practices. The farmers practice (T_2) involves indiscriminate application of fertilizers and usage of fungicides and non adoption on the usage of bioagents.

The observations on percent wilt incidence and nematode gall index were recorded. Gall index was assessed by counting the number of galls per root system and rating was given based on their numbers The number of galls/root system was assessed and assigned a severity scale from 0 to 5 (0=no galls, 1=1–2, 2=3–10, 3=11–30, 4=31–100, 5=>100 galls per root system) (Taylor and Sasser, 1978).

Wilt incidence was assessed by the formula:

$$\frac{\text{Number of infected plants}}{\text{Total number of plants}} \times 100$$

Flower yield data were collected from farmers practice and demonstration plots. The gross returns, cost of cultivation, net returns and benefit cost ratio (B:C ratio) were calculated by using prevailing prices of inputs and outputs and finally the extension gap, technology gap and technology index were worked out. To estimate the technology gap, extension gap and technology index, following formulae given by Samui *et al* (2000) was used.

Technology gap = Potential yield (q/ha) - Demonstration yield (q/ha)

Extension gap = Demonstration yield (q/ha) -farmer's practice yield (q/ha).

$$\text{Technology Index} = \frac{\text{(Potential yield- Demonstration yield)}}{\text{Potential yield}} \times 100$$

RESULTS AND DISCUSSION

Disease Incidence

The results revealed that demonstration plots recorded gall index of 1.5 and 4 per cent wilt incidence whereas farmers practice recorded gall index of 3.4 and 16 per cent wilt incidence respectively which were 55.88 per cent less for gall index and 75 per cent low for wilt incidence over farmers practice (Table 1). Meena *et al* (2015) reported that increased *Fusarium* wilt incidence could be due to the presence of root knot nematodes in Gerbera. Similarly, application of *B subtilis* and *P fluorescens* at monthly interval showed maximum efficacy against the management of nematode – fungus disease complex in tuberose Meena *et al* (2016). The effect of bioagents on the reduction of severity of nematode disease complex has been documented earlier by El-Shennawy *et al* (2012) in potato and Rao *et al* (2014) in tuberose.

Flower Yield

The productivity of tuberose ranged from 185.6 to 205.5q/ha with mean yield of 190.65 q/ha under demonstration practice on farmers field as against a yield ranged from 145.6 to 160.5 q/ha with a mean of

Table 1. Comparison of nematode disease complex and economics in Tuberose.

Sr. No.	Parameter	T_1	T_2	Percent reduction / increase
1	Root Knot Nematode Gall Index	1.5	3.4	55.88
2	Wilt incidence (%)	4	16	75.00
3	Flower yield (q /ha)	190.65	150.66	20.97
4	Gross cost (Rs./ha)	401050	348380	13.13
5	Gross income(Rs./ha)	857925	602640	29.75
6	Net income(Rs./ha)	456875	254260	44.34
7	BCR	2.14	1.73	

Table 2. Technology gap, extension gap and technology Index of Tuberose.

Sr. No.	Particular	Yield (q/ha)	Potential yield (q/ha)	Technology gap (q/ha)	Extension gap(q/ha)	Technology Index (%)
1	T_1	190.65	200.0	9.35	39.99	4.68
2	T_2	150.66	200.0			

150.66 q/ha recorded under farmers practice (Table 1). In comparison to farmers practice 20.97 per cent increase in yield was observed under demonstration practice. The higher yield under demonstration practices was due to the application of integrated management practices. Presence of both nematode and fungus caused greater reduction in growth of the plants which as reported by Shokoohi *et al* (2004) in different melon varieties. Naznin *et al* (2015) found that use of *Trichoderma* had a positive impact on growth and yield of tuberose. Likewise Mazhabi *et al* (2011) investigated the effect of *Trichoderma* spp. on growth of tuberose and its ability to control stem rot disease caused by *Rhizoctonia solani.*

The inputs and outputs prices of commodities of demonstrations were taken for calculating cost of cultivation, net returns and benefit cost ratio. The cost of cultivation by applying improved practices ranged between Rs. 3,85,000/- to 4,15,000/ha with a mean value of Rs. 4,01,050/ha against farmers practice where the variation in cost of production was Rs. 3,35,000/- Rs. 3,55,000/ha, with a mean of Rs. 3,48,380/ha. Cultivation of tuberose under demonstration practices gave higher net return of Rs. 4,56,875/ha compared to Rs. 2,54,260/ha under farmers practice. The additional net income was Rs. 2,02,615/ha over farmers practice. The average benefit cost ratio of demonstration practices was 2.14, varying from 1.88 to 2.31 and that of farmers practice was 1.73, varying from 1.59 to 2.14. This may be due to higher yields obtained under demonstration practices compared to farmers practice.

The extension gap was 39.99 q/ha during the period of study which emphasized the need to educate the farmers through various means for the adoption of improved agricultural production to reverse the trend of wide extension gap (Table 2). The technology gap in the demonstration yield over potential yield were 9.35q/ha. The technological gap may be attributed to the dissimilarity in the soil fertility status. The latest technologies will eventually lead the farmers to discontinue the traditional technology and to adopt new technology. The technology index was 4.68 percent which showed the feasibility of the evolved technology at the farmer's field. Tiwari *et al* (2015) reported that the lower the value of technology index, the more is the feasibility of the technology.

CONCLUSION

The results revealed that demonstration of integrated management practice would reduce the nematode disease complex and increase the yield in tuberose. This FLD showcased a significant positive result on increasing the productivity potential and profitability through the latest technology under real farming situation. Undoubtedly, usage of Biogents in crop cultivation enhanced the yield and flower quality in tuberose.

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Received on 03/09/2019 *Accepted on 08/12/2019*