

RESEARCH ARTICLE :

Assessment of bio fertilizer through farmers participatory approach for integrated nutrient management in marigold

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SUMMARY : Marigold has earned tremendous popularity as floral crop in Madhya Pradesh particularly at Indore district where it is being commercially cultivated as loose flower at around 2300 hectare in open field condition. With the objectives to address the problem of low yield with poor quality flower of marigold leading to lower economic returns, an assessment of integrated nutrient management with bio fertilizer application in marigold under open field condition was attempted during year 2015-16 and 2016-17 by Krishi Vigyan Kendra, Kasturbagram consisting 10 innovative farmers with three treatment, including farmers practice T₁ (NPK @ 60-90-32 kg/hac), recommended practice T₂ (NPK 200 kg – 100 kg – 80 + 20 tonnes FYM/ha) and modified recommended practice T₃ (NPK @ 150 kg -100 kg - 80 kg + *Azotobacter* and PSB @5kg/Hac + 20 tonnes FYM/ha). Out of three treatment, flower yield under the modified recommended practice (105.1 q/ha) was significantly higher than recommended practice (99.23 q/ha) followed by farmers practice (86.40 q/ha). Similarly gross income (Rs. 157650.00), net return (Rs. 96156.00) and BC ratio (2.56) under modified recommended practice were also recorded significantly higher over recommended practice (T₂) and farmers practice (T₁). Flower diameter in terms of centimetre was recorded highest (3.39 cm) under refinement (T₂) followed by recommended (T₂) 3.06 cm and farmer’s practice (T₁) 2.45 cm.

KEY WORDS :

Marigold, On farm trial, Bio fertilizer

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BACKGROUND AND OBJECTIVES

Marigold (*Tagetes erecta* Linn.) becomes one of the most popular flowers in our country on account of its easy cultivation, wider adaptability and lucrative returns. Its habit of free flowering, short duration, and wide range of colours, shape, size and good keeping quality attracted the attention of flower

growers. Marigold has earned tremendous popularity as floral crop in Madhya Pradesh particularly at Indore district, where it is being commercially cultivated as loose flower at around 2300 hectare (Anonymous, 2016) in open field condition for making garland and religious offerings. The major cropping period of marigold under Indore district was July to December for fetching festive market for the

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period of Ganpati puja, Navratri and Deepawali. Although, the productivity and quality of marigold flower in the farmers' fields was observed stumpy, hence, considerable scope for its improvement exists. The major reason of low productivity and quality of flower as ascertained was indiscriminate and irregular use of inorganic fertilizer and no use of integrated nutrient management practices. At present circumstances a need has arisen for organic fertilizers including bio fertilizers to minimise dependency on synthetic fertilizers, consequently as an intervention on integrated nutrient management practices along with Bio fertilizers including *Azotobacter* and phosphate solubilising bacteria were used, which is an organic product containing a specific microorganism in concentrated form, derived either from the plant roots or from the soil of root zone (Chen, 2006; Gupta and Sen, 2013). These promote growth by increasing the availability of primary nutrients and/or growth stimulus to the target crop when applied to seed, plant surfaces, or in soil (Muraleedharan *et al.*, 2010). Biofertilizers have shown great potential as supplementary, renewable and environmental friendly sources of plant nutrients and are an important component of integrated nutrient management (INM) and integrated plant nutrition system (IPNS) (Raghuwanshi, 2012). With the objectives to address the problem of low yield with poor quality of flower of marigold leading to lower economic returns, an assessment of integrated nutrient management with bio fertilizer application in marigold under open field condition was attempted.

RESOURCES AND METHODS

On farm trials for assessment of bio fertilizer on integrated nutrient management in marigold were carried out at two adjoining villages namely Mirjapur and Ralamandal of Indore district during the year 2015-16 and 2016-17 by Krishi Vigyan Kendra, Kasturbagram. 10 innovative farmers from both the villages were selected for conducting the trial with three treatment including T₁-Farmers practice (Application of NPK @ 60-90-32 kg/ha) T₂- Recommended practice (Application of NPK 200 kg – 100 kg – 80 kg + 20 tonnes FYM/ha) and T₃ -Modified recommended practice (NPK @ 150 - 100 – 80 kg/ha + *Azotobacter* and PSB @ 5kg/ha + 20 tonnes FYM/ha). Well before the conducting of trial four major considerations were followed including farmer's perspective, farmer's participation, farmer's

management status and suitability of site as suggested by Singh (1999). The trial was also envisaged with four fundamental assumptions as suggested by Pillai (2003) viz., (i) when the technology is not acceptable for the farmers in recommended form and need minor modification, refinement or change, (ii) it needs the integration of related indigenous knowledge of the farmers with the scientific recommendations in the processes of refinement or modification, moreover the refinement or modification is a continuous process in the lack of available technological option specific to each microenvironment, (iii) the collaboration of farmers who have been experimenting on their own to evolve solutions to the constraints, in their farm and of the extension system which is vital in the process of technology development, and (iv) the technology or practices generated through on farm trials will become farmers' recommendation comprising a basket of alternatives and are the most appropriate to solve the problem. Keeping above in view, the on farm trials were executed for assessment of bio fertilizer for integrated nutrient management in marigold. The yield data were collected from all the modification, recommended and control plots (farmers practice) and there feasibility and economic viability were accessed.

OBSERVATIONS AND ANALYSIS

The data on yield and economic performance of on farm trial for assessment of bio fertilizers for integrated nutrient management in marigold were collected and their pooled data were statistically analysed and presented in Table 1. Out of three treatment *i.e.* T₁ - Farmers practice (Application of NPK @ 60-90-32 kg/hac) T₂ - Recommended practice (Application of NPK @ 200 kg – 100 kg – 80 kg + 20 tonnes FYM/hac) and T₃ - Modified recommended practice (NPK @ 150 kg -100 kg - 80 kg + *Azotobacter* and PSB @ 5kg/hac) yield, flower size, net return and B : C ratio were found significantly higher under T₃ (refinement) over T₁ and T₂. The data presented in Table 1 clearly pointed out that, flower yield under the modified recommended practice T₃ (105.1 q/ha) was significantly higher than farmers practice T₁ (86.40 q/ha) and recommended practice T₂ (99.23 q/ha). Similarly gross income (Rs. 157650.00), net return (Rs. 96156.00) and B:C ratio (2.56) under modification were also recorded significantly higher over farmers practice (T₁) and recommended practice (T₂). Data presented in Table

Table 1 : Effect of bio fertilizers on yield and economics of marigold (Data pooled for year 2015- 16 and 16-17)

Treatments	Yield (q/ha)	Cost of cultivation (Rs./ha)	Gross return (Rs./ha)	Net return (Rs./ha)	B : C ratio	Flower size (cm)
T ₁ - Farmer practice	86.40	60200.00	129600.00	69400.00	2.15	2.45
T ₂ - Recommended practice	99.23	59227.25	148837.50	89610.25	2.52	3.06
T ₃ - Modified recommended practice/Refinement	105.10	61494.00	157650.00	96156.00	2.56	3.39
S.E. ±	1.89	950.14	2832.90	2554.49	0.05	0.14
C.D. (P=0.05)	5.611	NS	8416.88	7589.70	0.151	0.43

NS=Non-significant

It also illustrated that the cost of cultivation under all the treatment were observed non significant, it was due to similar agronomical practices under all the treatment and year, except the use of inorganic fertilizers and bio fertilizers. Flower diameter in terms of centimetre was also recorded highest (3.39 cm) under refinement (T₃) followed by recommended *i.e.* T₂ (3.06 cm) and farmer's practice T₁ (2.45 cm). Use of biofertilizers under T₃ cost Rs. 400/ha with reduction of 20 per cent nitrogenous and phosphoric fertilizers. It is generally agreed that there is certain increase in yield which is possible with the establishment of *Azotobacter* in the rhizosphere of various crop plant. Mukharjee (2003) narrated that depending on identification and use of farming situation, specific interventions may have greater implications in enhancing system productivity. Significant yield increase was recorded with inoculation of *Azotobacter* in different crops by Kumaraswamy and Madalageri (1990) and Marula *et al.* (1991). The beneficial use of nitrogen fixing microorganism's *viz.*, *Azotobacter* and phosphate solubilizing bacteria (PSBs), as a supplementary source of plant nutrition on agricultural crops was well documented by Barakart *et al.* (1998). These non-conventional sources of fertilizers are not only cost effective but simultaneously boost up the productivity of soil and crop (Patra *et al.*, 1989).

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