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Impact of Bio-Fertilizers on the Yield and Economics of Chrysanthemum Under Real Farming Situation

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Abstract

Chrysanthemum (*Dendranthemagrandiflora*Tzvelev.) has earned tremendous popularity as a floral crop in Madhya Pradesh, particularly at Indore, Madhya Pradesh , India where it is being commercially cultivated as loose flowers in open field condition during June to January. However, lower production and poor quality of flowers were observed due to hap hazard and unbalanced use of inorganic fertilizers and non use of biofertilizers. With the objectives to tackle the issue of low productivity and quality of flowers, dissemination of recommended technology was successfully attempted during 2015-16 and 2016-17. The technologies of balanced use of inorganic fertilizer with bioferetilizer (Azotobactor and PSB) were used as technical intervention. The collective effect of scientific intervention revealed an average yield of 113 quintal / ha, which is 14.76% higher over farmer's practice. Average net returns from recommended technology were observed to be of Rs. 1, 88,100 as compared to Rs. 1, 54,350 under farmer's practice (control).Thus, an additional income of Rs33,750 was realized through imparted technological intervention provided in demonstration plots. Cost-benefit ratio of recommended practice (2.25) was observed to be significantly higher over farmer's practice (2.17). Enhanced economic benefit and favorable C: B proved the economic feasibility of the technological intervention and was convincing for the farmers, for further future adoption. At present scenario, organic fertilizers including bio fertilizers are becoming indispensableinput to minimise our compulsion on synthetic fertilizers.

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Introduction

Chrysanthemum (*Dendranthemagrandiflora*Tzvelev.) is commonly called as Guldawdi,saventi or Autumn Queen and belongs to the family Asteraceae. It is one of the leading commercial flowers grown throughout the world. In India, Chrysanthemum occupies a prime position as apious cut flower for all traditional uses and also as an ornamental flower for the garden. Its wide popularity is due to its wide variations exhibited with respect to growth, habit, size,

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shape, and colour of the bloom. Chrysanthemum has earned tremendous popularity as floral crop in Madhya Pradesh particularly at Indore district where it is being commercially cultivated as loose flowers in about 95 hectare[2] in open field condition during June to January. Although, the productivity and quality in the farmers' fields observed were very low, considerable scope for its improvement exists. It becomes realistic to detect the reason in the wake of low productivity and flower quality by means of survey, farmer's interaction and problem-solving field visit.The foremost reason of low productivity and poor flower quality as as certained during regular surveys, farmers meetings and field diagnostic visits was unscientific and unbalanced use of inorganic fertilizers and non implementation of integrated nutrient management practices. At present scenario organic fertilizers including bio fertilizers are becoming inevitable input to minimise our dependency on synthetic fertilizers. Consequently as an intervention on integrated nutrient management practices along with Biofertilizers including Azotobactor and Phosphate solubilising bacteriawere used, which are input containing microorganisms, competent of mobilizing nutritive elements from unusable to usable form in the course of biological procedure. Biofertilizers are inexpensive, eco-friendly, feasible and sustainable inputs.Theydo not require any renewable supply of energy during production.They are useful as bio-control agents for controlling many plant pathogens and harmful microorganisms of field crops and aid sustainable flower production through protection of soil productivity. Biofertilizers have shown a good promise and have come forward as avital component of integrated nutrient management system, which are of greater significance of growing chrysanthemum under open field condition, are (i) Biological Nitrogen Fixers. And (ii) Phosphate solubilizers.With the objectives to address the problem of low yield with poor quality produce leading to lower economic returns, Integrated nutrient management with biofertilizer application in chrysanthemum under open field condition were attempted.

Methodology

To improve the yield and income level from chrysanthemum crop, the technology dissemination programme was carried out under real farming situation consecutively for the years 2015-16 & 2016-17 at village Mirzapurof Indore district, Madhya Pradesh during June to January. A total of 20 on farm demonstrations were organized during the period. Area distributed under each demonstration plot was 0.40 hectare (1.0Acre) with Rajamal (Local) variety of chrysanthemum. The imparted technological intervention was based on the information gathered through surveys, farmer's interaction and problem solving field visit during the cropping period, which brought out that arbitrary and unbalanced use of inorganic fertilizers and no use of biofertilizers, were the causes of low yield of loose flowers of chrysanthemum.The technologies of balanced use of recommended levels of nitrogen, phosphorus and potash (150-200,200, 200[5,15, 17,8] coupled with biofertilizer, namely Phosphorus solublizing bacteria (PSB) and azotobacter[1] were used as technical intervention during the course of on farm demonstration. 20 percent reduction in nitrogenous and phosphoric fertilizer was made under recommended practice. Local check (control)was comprised of existing farmer's practiceof indiscriminate use of fertilizers (N50-60 P 300-400 and K 100 Kg/ha)without incorporation of biofertilizer.

The yield performance of both, farmer's practice(FP) and recommended practice (RP) were recorded. Prior to the conducting experimental demonstration, training to the farmers of particular vllages were conducted with regard to calculated technical interventions. Further steps like selection of experimental site, layout, farmers' participation etc. were followed as recommended by Choudhary *et al.,*[6]. Plot-wise yield data were recorded from demonstration and farmer's plots. Information of cost of cultivation was also recorded for economic evaluation in terms of net profit earned and the benefit cast ratio.

Result & Discussion

The data (Table - 1) revealed that under recommended practice, the flower yield was recorded to be considerably higher than under farmer's practice for the period of field demonstrations. The flower yield enhancement over farmer's practice, although varied (14.42 to 15.10 %) from year to year, it was 14.76 per cent on mean basis .Year wise fluctuations in yield and cost of cultivation can be elucidated on

the basis of difference in existing social, economical and microclimatic conditions of the particular village. Mukharjee[14] has also suggested thatdepending on recognition and use of farming situation, specific interventions may have larger implications on improving system efficiency. 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. Significant yield increase was recorded with the inoculation of azotobacter in different crops[11,10]. According to Mazid *et al.,*[11b]. Application of bio fertilizer into the soil, facilitate fast multiplication of microorganism which accelerate the microbial process in soil and augment availability of plant nutrients, which can be easily assimilated by plants. Khan *et al.,*[9] suggested that Bio-inoculants availability to the plants improve their growth and yield capacity. Yield enhancement at real farming situation indifferent crops through technology dissemination has amply been recognized by several researchers[7,19,20,13]. Technology dissemination programme has demonstrated to the farmers about the use of effective and economical inputs, which are free from environmentally undesirable implications that chemicals inputs have. Likewise, Bio fertilizers can perform as a renewable supplement to inorganic fertilizers as well as organic manures. Bio fertilizers are having special ability to generate natural resistance in plants against pests and soil borne diseases. Due to antibodies development and participation of microorganisms in soil, fertility status get better[4] with outcome as yield enhancement. Economic evaluation in terms of expenditure, gross income;, net income and cost benefit ratio obviously revealed that the net income from the recommended practice were considerably higher overfarmers practice (control plots)in both the years (2015-16 & 16-17) of technology dissemination programme. An average net income from recommended practice were recorded Rs. 1,88,100 while it wasRs 1,54,350 against farmer's practice , with an average additional income of Rs 33,750 and can be attributed to the technological intervention provided in demonstration plots.The benefit cost ratio of recommended practice was also substantially higher than farmer's practice. It worked out to 2.16, and 2.02 for recommended practice as compared to 2.35 and 2.17 for farmer's practice during 2015-16 and 2016-17, respectively. On mean basis it was 2.25 for recommended practice, whereas 2.17 for farmer's practice. Thus, favorable cost benefit ratio and higher net income demonstrate the financial feasibility of the intervention organized under recommended practice and persuaded the farmers about the utility of intervention provided at real farming situation. Similar findings were reported by Sharma[18] and Mishra[13] in different crops. The beneficial use of nitrogen fixing microorganism's *viz.,* Azotobacter and phosphate solublizing bacteria (PSBs), as a supplementary source of plant nutrition on agricultural crops is well documented[3]. These non-conventional sources of fertilizers are not only cost effective but simultaneously boost up the productivity of field crops[16].

The figures (Table 1)further indicate that highest increase in yield and cost benefit ratio was during 2016-17.The difference in yield and cost benefit ratio recorded during both the years. This was mainly in consequence of yield performance, input cost and rate of output in that particular year of demonstration. Cost of cultivation or expenditure under recommended practice was observed higher. This was due to expenditure incurred on harvesting and marketing of chrysanthemum.

Table 1: Yield and economic of chrysanthemum (Variety - Rajamal) under real farming situation (data pooled for years (2015-16& 16 -17)

Year	On farm demons-tration(No)	Yield (q/ha)		% increase over FP	Expenditure (Rs/ha)		Gross Income (Rs/ha)		Net Income (Rs/ha)		BC ratio	
		RP	FP		RP	FP	RP	FP	RP	FP	RP	FP
2015-16	10	109	95	14.42	150920	141300	326100	285000	175180	143700	2.16	2,02
2016-17	10	117	102	15.10	151180	141000	352200	306000	201020	165000	2.33	2.17
Mean	113	98.5	14.76	151050	141150	339150	295500	188100	154350	2.25	2.17	

RP – Recommended practice, FP –Farmer's practice, B: C Ratio –Benefit cost ratio.

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