RESEARCH ARTICLE

ECONOMIC STUDIES ON INTEGRATED NUTRIENT MANAGEMENT IN GLADIOLUS (*GLADIOLUS GRANDIFLORUS* L.)

Mohit Chaudhary[1]*, Sunil Malik[1], R.K. Naresh[2], Mukesh Kumar[1], Manoj Kumar Singh[1], Vivak Ujjwal[1] and Akash Kumar[3]

[1]Department of Horticulture, SVPUAT,Meerut, U.P.
[2]Department of Agronomy, SVPUAT,Meerut, U.P.
[3]Department of Floriculture and Landscape Architecture,YSPUHF,Solan, H.P.
Email: chaudhary.mohit100@gmail.com

Received-02.11.2020, Revised-27.11.2020

Abstract: Studies were conducted to find out the effect of Integrated Nutrient Management on various economic aspects of Gladiolus. It was observed that treatment containing 75% RDF + 25% Vermi-compost + *Azospirillum*+ PSB was found best treatment with reference to Gross income, Net income and B: C ratio during both the years of investigation. Therefore, it is recommended that INM approach with treatment consist of 75% RDF + 25% Vermi-compost + *Azospirillum* + PSB may be recommended for obtaining the maximum profit for the commercial cultivation of gladiolus crop.

Keywords: Gladiolus, INM, Profit

INTRODUCTION

Total area under cultivation of flowers in India is reported as 3.24 lakh hectares with a production of 19.62 lakh metric tonnes loose flowers and 8.23lakh metric tonnes cut flowers during 2017-18 (Anonymous, 2019). Gladiolus is an important commercial flower crop and is very popular as cut flower both in domestic and international market. India has a suitable agro-climatic condition for gladiolus cultivation, and so it is being grown over an area of 1.12 thousand hectare with a production of 54.59 million spikes (Anonymous, 2019). Gladiolus is very sensitive to nutrient application. It requires higher application of nitrogen, phosphorous and potassium. It was pointed out that chemical fertilizer alone should not be used for attaining maximum production and integrated nutrient management (INM) approach should be used to maintain the soil productivity (Patil and Dhaduk, 2010).

Agrochemicals are being used indiscriminately for production of cut flowers.Their continuous applications havecreated soil infertility, nutrient imbalance, accumulation of toxic chemicals within the soil and food products.This is leading to unproductive soil, ecosystem destruction, and environmental degradation and ultimately affecting the yield and quality of cut flowers. The use of organic manures, composts, crop residues and bio-fertilizers can work in a holistic approach along with chemical fertilizers for higher availability of nutrients (Wani*et al*., 2016). Sustainability in terms of higher level of soil fertility and productivity can be maintained along with less environmental problems using INM approach (Satapathy*et al*., 2016).Application of organic fertilizers in combination with chemical fertilizers (INM) helps in maintenance and improvement of soil fertility for sustainable crop productivity on long term basis. Thus, economic aspects of INM should be studied for cut flowers in general and Gladiolus in particular.

MATERIALS AND METHODS

The present investigation was carried outduring Rabi season of 2018-2019 and 2019-2020 at the Horticultural Research Centre of Sardar Vallabhbhai Patel University of Agriculture &Technology, Meerut, Uttar Pradesh, India.Gladiolus *cv.*White Prosperity was used for studies. The experiments were conducted using Randomized Block Design with three replications. Studies were conducted with 14 treatments namely Control (without application of manure and fertilizers), 300 Kg N + 200 Kg P_2O_5 + 200 KgK_2O/ha (RDF), RDF + 25% FYM,RDF + 25% Vermi-compost, 75% RDF + 25% FYM, 75% RDF + 25% Vermi-compost, 75 % RDF + 25% FYM + *Azospirillum*, 75%RDF + 25% FYM + *Azospirillum* + PSB, 75% RDF + 25% Vermi-compost + *Azospirillum* + PSB, RDF + $ZnSO_4$ (0.3%), RDF + $FeSO_4$ (0.4%), RDF + $ZnSO_4$+ *Azotobacter* + PSB and RDF + $FeSO_4$+ *Azotobacter* + PSB.The full calculated dose of farmyard manure as per treatment combination was broadcasted as basal dose and mixed in soil to the individual specified plots before two weeks for proper mineralization before sowing of corms. However, vermi-compost and biofertilizers like PSB, *Azotobacter* and *Azospirillum* were mixed with soil at three leaf stages and six leaf stages.Inorganic fertilizers were applied as per the treatment combinations. At the time of planting recommended dose of single super phosphate and muriate of potash was applied as basal dose. The crop was top dressed with Nitrogendose at three leaves stage and six leaves stage.

*Corresponding Author

The economics (net return per hectare) from all the treatments was worked out by deducting the total expenditure incurred under each treatment from the total (gross) income from the produce (gladiolus spike and corms) obtained from that treatment. The cost benefit ratio was worked out dividing the total expenditure from the gross income. B: C ratio was calculated by dividing the grass returns (₹ ha^{-1}) with cost of cultivation (₹ ha^{-1}).

Table 1. Economics of integrated nutrient management in Gladiolus during 2018-19.

Notation	Treatment details	Expenditure (Rs/ha)	Gross income (Rs/ha)	Net income (Rs/ha)	B:C Ratio
T_1	Control	267177	505260	238083	0.891
T_2	300 Kg N + 200 Kg P_2O_5 + 200 KgK_2O/ha (RDF)	290107	577975	287868	0.992
T_3	RDF + 25% FYM	300507	615960	315453	1.050
T_4	RDF + 25% Vermicompost	297707	654865	357158	1.200
T_5	75% RDF + 25% FYM	295780	692049	396269	1.340
T_6	75% RDF + 25% Vermicompost	291780	650200	358420	1.228
T_7	75% RDF + 25% FYM + Azospirillum	303030	692234	389204	1.284
T_8	75% RDF + 25% Vermicompost +Azospirillum	293030	713995	420965	1.437
T_9	75% RDF + 25% FYM + Azospirillum + PSB	303230	691540	388310	1.281
T_{10}	75% RDF + 25% Vermicompost + Azospirillum + PSB	293230	832618	539388	1.839
T_{11}	RDF + $ZnSO_4$ (0.3%)	291907	684353	392446	1.344
T_{12}	RDF + $FeSO_4$ (0.4%)	292007	652758	360751	1.235
T_{13}	RDF + $ZnSO_4$+ Azotobacter + PSB	292277	732260	439983	1.505
T_{14}	RDF + $FeSO_4$+ Azotobacter + PSB	292377	718949	426572	1.459

Table 2: Economics of integrated nutrient management in Gladiolus during 2019-20.

Notation	Treatment details	Expenditure (Rs/ha)	Gross income (Rs/ha)	Net income (Rs/ha)	B:C Ratio
T_1	Control	272521	522560	250039	0.918
T_2	300 Kg N + 200 Kg P_2O_5 + 200 KgK_2O/ha (RDF)	295909	601785	305876	1.034
T_3	RDF + 25% FYM	306517	635450	328933	1.073

T_4	RDF + 25% Vermicompost	303661	677330	373669	1.231
T_5	75% RDF + 25% FYM	301696	714930	413234	1.370
T_6	75% RDF + 25% Vermicompost	297616	672355	374739	1.259
T_7	75% RDF + 25% FYM + Azospirillum	309091	714745	405654	1.312
T_8	75% RDF + 25% Vermicompost +Azospirillum	298891	735910	437019	1.462
T_9	75% RDF + 25% FYM + Azospirillum + PSB	309295	708580	399285	1.291
T_{10}	75% RDF + 25% Vermicompost + Azospirillum + PSB	299095	851235	552140	1.846
T_{11}	RDF + $ZnSO_4$ (0.3%)	297745	704500	406755	1.366
T_{12}	RDF + $FeSO_4$ (0.4%)	297847	673830	375983	1.262
T_{13}	RDF + $ZnSO_4$+ Azotobacter + PSB	298123	748310	450187	1.510
T_{14}	RDF + $FeSO_4$+ Azotobacter + PSB	298225	737825	439600	1.474

RESULTS AND DISCUSSION

Cost of cultivation (₹ha^{-1})

The cost of cultivation in different treatments differed significantly due to the variation in the cost of biofertilizers, micronutrients, organic and chemical fertilizers (Table 1 & 2). Results showed that highest cost of cultivation (Rs. 303230/ha and Rs. 309295/ha) among all the treatments was recorded with 75% RDF + 25% FYM + *Azospirillum* + PSB followed by 75% RDF + 25% FYM + *Azospirillum* (Rs. 303030/ha and Rs. 309091/ha) during the year 2018-19 and 2019-20 respectively. The lowest cost of cultivation (Rs. 267177/ha and Rs. 272521/ha) was recorded with control during the year 2018-19 and 2019-20 respectively. As a result, the cost of cultivation in the present study varied from Rs. 267177/ha to Rs. 303230/ha and Rs. 272521/ha to Rs. 309091/ha during the year 2018-19 and 2019-20 respectively.

Gross income (₹ha^{-1})

Gross income as affected by various treatments varied from Rs. 505260/ha to Rs. 832618/ha and Rs. 522560/ha to Rs. 851235/ha during 2018-19 and 2019-20, respectively. The highest gross income (Rs. 832618/ha and Rs. 851235/ha) was recorded with 75% RDF + 25% Vermicompost + *Azospirillum* + PSB during both the years. The lowest gross income in the present study, however, was registered withcontrol *i.e.,* Rs. 505260/ha and Rs. 522560/ha during 2018-19 and 2019-20, respectively.

Net income (Rs/ha)

The highest net return Rs. 539388/ha and Rs. 552140/ha was obtained in treatment 75% RDF + 25% Vermi-compost + *Azospirillum* + PSB during both the years, followed by Rs. 439983/ha and Rs. 450187/ha in RDF + $ZnSO_4$+ *Azotobacter* + PSB whereas lowest return Rs. 238083/ha and Rs. 250039/ha was recorded with treatment control during 2018-19 and 2019-20 respectively.

B:C ratio

The benefit cost ratio under different treatments varied from 0.891 to 1.839 and 0.918 to 1.846 during 2018-19 and 2019-20, respectively. Among the different treatments maximum benefit cost ratio of 1.839 during 2018-19 and 1.846 during 2019-20 was recorded with 75 % RDF + 25% vermi-compost + *Azospirillum* + PSB. However, it was recorded minimum (0.891 and 0.918) under control during 2018-19 and 2019-20, respectively.

It was observed that gross return, net return and B:C ratio was highest with the application of 75% recommended NPK along with vermi-compost and biofertilizers. Such higher returns were due to the highest yield of the gladiolus with INM treatment. INM can improve farmers income as evident from highest returns.Along with higher returns INM also improves the soil health. It is concluded that INM should be used for improving the sustainability of Gladiolus crop in Western Plain Zone of Uttar Pradesh. The results obtained are in conformity with the findings of Verma*et al.,* (2011), Rashmi and Chandrashekar *et al.,* (2016) and Avilala*et al.,* (2020).

REFERENCES

Anonymous (2019). Horticulture Statistics at a Glance. Department of Agriculture, Cooperation & Farmers Welfare, Ministry of Agriculture & Farmers Welfare, Government of India, New Delhi.

Avilala, D. P., Lakshmi, K. S., Nagaraju, R. and Reddy, D. D. (2020).Economics of different gladiolus cultivars grown under open field conditions in southern zone of Andhra Pradesh. *Plant Archives*. **20(1):** 670-672.

Patil, S.D. and Dhaduk, B.K. (2010) Effect of fertilizer levels and spacing on performance of gladiolus cultivars. *Journal of Maharashtra Agriculture Universities.***35:** 166-169.

Rashmi, R. and Chandrashekar, S. Y. (2016).Economic feasibility and profitability of gladiolus (*gladiolus hybridus*L.) cultivation under open field condition. *Journal of Plant Development Science*. **8 (7):**355-358.

Satapathy, S.P., Toppo, R., Dishri, M. and Mohanty, C.R. (2016) Impact of integrated nutrient management on flowering and corm production in gladiolus. *Biometrics & Biostatistics International Journal*.**4:** 1-19.

Verma, S. K., Angadi, S. G., Patil, V. S., Mokashi, A. N., Mathad, J. C. and Mummigatti, U. V. (2011). Growth, yield and quality of chrysanthemum (*Chrysanthemum morifolium* Ramat.) cv. Raja as influenced by integrated nutrient management. *Karnataka Journal of Agricultural Sciences.***24 (5):** (681-683).

Wani, S.A., Ali, T., Chand, S. and Sofi, K.A. (2016) Improving soil health and productivity in brown sarson var. KS-101 (*Brassica rapa* L.) in alfisols of temperate Kashmir through organic and inorganic nutrient sources. *Ecology Environment Conservation.***22:** 21-22.