Response of N, P, K on Corm production, vegetative Growth and spike of Red Ginger variety of Gladiolus under Partial shades of Apple orchids in jammu

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Abstract
Investigations were carried out to study the effect of fertilizer levels on vegetative growth, flowering and com production attributes in gladiolus Cultivar Red Ginger under partial shades of apple orchard. Significantly number of leaves per plant and number of florets per spike remaining open at a time were recorded with treatment $N_{50}P_{25}K_{25}$ g/m^2, whereas significantly maximum plant height was obtained by application of $N_{40}P_{20}K_{20}$ g/m^2. Treatment $N_{10}P_5K_5$g/m² advanced the time for showing colour in the first floret. Application of $N_{40}P_{20}K_{20}$ g/m^2 significantly increased spike length, number of florets per spike, diameter of first floret, life of spike at well as durability of whole spike under field and thus found as optimal dose for these floral characters. A gradual, steady and significant increase in corms produced per plant, corm size and weight as well as number of cormels per plant was observed with increasing fertilizer levels recording highest values at $N_{50}P_{25}K_{25}$ g/m^2
Key words: Corm, gladiolus, Apple, nitrogen, phosphorus, potassium, and spike.

Introduction

Apple the leading fruit crop of Jammu and Kashmir, being cultivated in Kashmir and Temperate areas of Jammu and new plantation is increasing throughout the union terrority of Jammu and Kashmir. The initial investment required in establishment of Apple orchard is quite high and beyond the economic reach of small and marginal farmers. Quite a large area in a properly spaced Apple Orchard remains unoccupied or almost bare. Moreover, the increasing pressure on land resources necessitates intensification in overall production. This situation makes it imperative for an orchardist to grow some short duration crops in interspace for earlier economic returns.

in India, usually cereals, pulses, vegetables and certain oil seeds are grown as inter-crops in young commercial orchards of mango by progressive farmers giving good returns without any adverse effect on growth and yield of mango (Rajput et al., 1986), commercial flowers like gladiolus or marigold having high profitability should be explored as intercrop in these orchards especially in view of the fact that when flower crops are adequately fertilized and well cultivated, the condition of fruit tree growth is usually good (Krishnamurthi, 1958). The nutritional requirement of flower crops has to be well taken care of as it not only affects the production but also the quality of flowers. In view of the lack of information regarding performance of gladiolus as inter-crop in the available space of Apple orchard, importance of its rate of fertilization for proper nutrition for increased vegetative growth, flowering and corm yield, the present investigation was taken up. Gladiolus known as August flower has potential to change economic scenario of poor –marginal farming community across the globe. A single corm of gladiolus has potential to bring colour revolution in marginal farmer's economy. Red ginger variety of Gladiolus (Red beauty x Sarla) Fetches good market because of its spike length (55cms.) and number of florets per spike (20)

MATERIALS AND METHODS

Batote Mountains are underlain by the brown Earth soils. The soil in the district is generally loose and sandy with very low moisture. The water samples collected from springs and deeper aquifer, concentration of iron ranges from traces to 1.70 mg per litre and 0.37 mg per litre respectively The

present investigation was carried out at the Agriculture Farm, Department of Horticulture, Batote Udhampur (Jammu) The soil of the experimental field was silt loam with a pH of 7.22 and EC 0.70 M mhos/ cm. The available nitrogen, phosphorus and potassium contents of soil were 233, 11 and 355 kg/ha, respectively. Ten year old trees of APPLE cv. Red Delicious raised on seedling root- stock planted at 10 x 10m distance in square system were selected for experiment. Gladiolus cv. Red Ginger was selected for this study, which was planted in the available space in Apple orchard. The experiment was laid out in a randomized block design with four replications, using six fertilizer (NPK) levels applied to gladiolus viz., $N_0P_0K_0$, $N1_0P_5K_5$, $N_{20}P_{10}K_{10}$, $N_{30}P_{15}K_{15}$, $N_{40}P_{20}K_{20}$ and $N_{50}P_{25}K_{25}$ g/m². The individual plot size was 2.0 x 1.5m, leaving a distance of 2.5 m from the sides of the tree and distance of 1 m was left between two plots. A uniform dose of F.Y.M. @ 4 kg/m² was applied to all the plots three weeks before planting. Each plot was surrounded by a bund to prevent the movement of water and nutrients.

Required quantities of each fertilizer, according to different treatments were weighed. Whole amount of phosphorus, potash and half dose of nitrogen were incorporated into the soil as basal dose at the time of corn planting and remaining half dose of nitrogen was applied at flower spike emergence stage to all the treatments. Nitrogen, phosphorus and potassium were applied through calcium ammonium nitrate, single super phosphate and muriate of potash, respectively. Two years data were pooled, analysed statistically and presented in Table 1.

RESULTS AND DISCUSSION

Table 1 gives clear picture that vegetative growth in terms of number of leaves and height of plant increased significantly with increase in levels of nitrogen, phosphorus and potassium over control. Significantly more number of leaves per plant (8.42) were recorded with treatment $N_{50}P_{25}K_{25}$ g/m², which was having at par effect with that of $N_{40}P_{20}K_{20}$ g/m². Similarly, the effects of $N_{30}P_{15}K_{15}$,and $N_{20}P_{10}K_{10}$ g/m² treatment on number of leaves were at par but significantly lower than that of $N_{40}P_{20}K_{20}$ g/m². The minimum number of leaves (6.15) was recorded under control ($N_0P_0K_0$ g/m³).

Significantly highest plant height (79.15 cm) was obtained by application of $N_{40}P_{20}K_{20}$ g/m² followed by at $N_{50}P_{25}K_{25}$ g/m (77.90 cm). The minimum plant height (63.37 cm) was obtained with treatment $N_0P_0K_0$ g/m². The improvement in number of leaves per plant and plant height with the application of increasing dose of NPK could be attributed to better nutrient supply to plants.

Nitrogen is the most important constituent of chlorophyll and is a component of amino acids and enzymes and thus it might have increased the meristematic activities, cell division, cell number and cell enlargement of the plant (Kumar and Misra, 2003). The presence of calcium ions in calcium ammonium nitrate (CAN) has been reported to increase nitrate and ammonium. absorption in plants (Fenn et al., 1994) thereby supplying adequate nutrition for the growth of plant. Phosphorus promotes root development and enhances uptake of nitrogen. It stimulates the root system through efficient translocation of certain growth stimulating compounds formed in plants to the roots, which might have enhanced the absorption of nutrients thus resulting in a vigorous growth. Plants supplied with higher dose of phosphorus along with nitrogen might have continuously maintained and enhanced the vegetative growth. Good vegetative growth by application of higher doses of nitrogen and phosphorus in gladiolus has also been reported by Jain and Verma (2004).

Different nutrients levels had a pronounced effect on days to first floret showing colour and differed significantly with control. Treatment $N_{10}P_5K_5$, g/m² was found to be early (112.37) in reaching the stage

of showing colour in first floret, whereas treatment $N_{50}P_{25}K_{25}$ g/m² to be as late (121.20). A balance supply of nitrogen promotes the translocation of phytohormones to the shoot which might have probably induced early flower initiation and colouring. In fact plant keeps a balance between the vegetative and reproductive growth. The negative effect of high dose of NPK might be due to interference and disturbance of balance (Singh and Bijmol, 2000). Higher levels of nitrogen and phosphorus are known to prolong vegetative growth by encouraging vigorous growth, more photosynthetic area for greater production and mobilization of photosnthates resulting in delay of the reproductive phase which consequently delay flowering (Kumar and Misra, 2003). it is quite clear from table 1 that treatment $N_{40}P_{20}K_{20}$ g/ m² showed marked positive influence on spike length (78.00cm) followed by a higher dose of $N_{50}P_{25}K_{25}$g/m² (75.30 cm). The treatments $N_{10}P_5K_5$ g/m² and $N_{20}P_{10}K_{10}$ g/m² were found to have at par effects on spike length, which were significantly higher than that of control but lower than those at higher fertilizer levels. The shortest spike length (59.00 cm) was obtained with control. Highest number of florets per spike (15.20) was obtained by application of $N_{40}P_{20}K_{20}$ g/m² which was significantly higher than all other treatments, followed by 14.30 on application of $N_{50}P_{25}K_{25}$g/m² and lowest (9.71) with $N_0P_0K_0$ g/ m². However, the application of $N_{30}P_{15}K_{15}$ g/m² gave number of florets per spike at par with $N_{40}P_{20}K_{20}$ g/m² number of florets per spike (15.20). This might be due to the presence of calcium in calcium ammonium nitrate and sulphur in single super phosphate which might have participated in higher protein synthesis and thus improved the vegetative growth, dry matter accumulation and partitioning of nutrients towards the developing spikes (Kumar and Misra, 2003).Table 1. Effect of NPK levels on vegetative, flowering, and corm production attributes in Gladiolus cultivar Red Ginger Grown in Apple orchard (two season pooled data).

Fertilizer level (g/m²)	Plant height (cm)	No. of leaves/ plant	Days to first floret showing color	Spike length (cm)	No. of florets / spike	No. of florets remaining opening at a	No. of corms / plant	No. of cormels / plant
$N_0P_0K_0$	63.32	6.12	113.40	58.95	9.06	3.55	1.06	10.81
$N_{10}P_5K_5$	68.82	6.82	112.32	66.63	11.48	3.72	1.20	11.95
$N_{20}P_{10}K_{10}$	74.35	7.39	113.95	67.72	12.72	3.85	1.32	12.69
$N_{30}P_{15}K_{15}$	76.45	7.52	115.95	72.18	13.82	4.46	1.42	13.90
$N_{40}P_{20}K_{20}$	**79.10**	**8.13**	**117.16**	**77.95**	**15.15**	**4.58**	**1.59**	**16.22**
$N_{50}P_{25}K_{25}$	77.85	8.39	121.15	75.25	14.25	4.65	1.71	19.60
C.D. (P=0.05)	0.66	0.50	0.72	1.11	0.60	0.29	0.08	0.86

The effects of treatments $N_{30}P_{15}K_{15}$, $N_{40}P_{20}K_{20}$ and $N_{50}P_{25}K_{25}$ g/m² were at par on number of florets remaining open at a time but these treatments were significantly superior to $N_0P_0K_0$, $N_{10}P_5K_5$ and $N_{20}P_{10}K_{10}$ g/m²which had at par effect on number of florets remaining open at a time. However, the treatment $N_{50}P_{25}K_{25}$ g/m² was found 50 to give maximum number of florets remaining open at a time (4.70), whereas the minimum number of florets open at a time (3.60) was recorded with $N_0P_0K_0$ g/m². The results support the findings of Shah et al. (1984) in gladiolus. Corm production differed markedly with the application of different NPK levels. A gradual and a significant increase was observed with every incremental level of fertilizer application from $N_0P_0K_0$ to $N_{50}P_{25}K_{25}$ g/m². Application of $N_{50}P_{25}K_{25}$ g/m² produced maximum number of NP corms (1.75) and

cormels per plant (19.66). The results demonstrate that corms were more responsive to NPK application resulting in significantly more number of corms. Also, higher level of nitrogen and phosphorus increased total leaf area of plant causing high dry matter accumulation in the plant (Potti and Arora, 1986) and its greater mobilization in corms and cormels hence the better yield of these. These findings are in conformity with the results of Singh and Bijmol (2000); Sehrawat et al. (2003), who reported improvement in corm and cormel production with an increase in fertilizer levels. It may be concluded that when gladiolus was grown as inter-crop in young Apple orchard, application of higher levels of NPK were found to be beneficial in improving the vegetative growth, flowering and corm production parameters of gladiolus.

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