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Response of different potassium fertilizer levels through fertigation on rose (*Rosa indica*) cv. PASSION under protected cultivation

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Abstract **:** The present experiment was conducted at Hi-Tech Floriculture Research Project, Fruit Research Station, Aurangabad. The experiment was planned in poly house for the rose cv. Passion (red) with three levels of fertilizers supplied through drenching with a control level of fertigation. The experiment was laid out in completely randomized design (CRD) with four treatments and 12 replications. Data generated indicated the effective influence of different K levels of fertilizer application. For investigation K levels of fertilizers *i.e.* 100 per cent K_2O regular farmer practice (control), 20 per cent increase of K_2O over regular farmer practice supplied through drenching, 40 per cent increase of K_2O over regular farmer practice supplied through drenching and 60 per cent increase of K_2O over regular farmer practice supplied through drenching were applied and the observations recorded which consisted of vegetative characters, flower quality characters, flower yield characters, vase life study, water requirement and cost of cultivation. The treatment which was consisted of 60 per cent increase of K_2O over regular farmer practice supplied through drenching was found superior in number of branches per plant, leaf area, diameter of flower, number of petals per flower, weight of flower, number of flowers per plant, number of flower per m^2, number of flowers per treatments, vase life over rest of the treatments. However, treatment which was consisted of 40 per cent increase of K_2O over regular farmer practice supplied through drenching was found superior in flower stalk length, girth of flower stalk over rest of the treatments. The water requirement for rose cv. Passion was obtained 495.10 ml/pot/day in February, 596.38 ml/pot/day in March and in April it was 696.70 ml/pot/day in polyhouse condition. The cost economics point of view the treatment which was consisted of 40 per cent increase of K_2O over RFP supplied through drenching was found superior because it had a more B-C ratio over rest of the treatments.

Key words **:** Potassium fertilizer, Fvertigation, Rose, Protected cultivation

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In spite of long tradition of agriculture and floriculture, India share in the International market for cut flowers is hardly 0.04 per cent of the global trade. The most important cut flower traded in the market is rose.A typically naturally ventilated structure contains a mesh covered top ventilator for escape of hot air. Besides, top ventilator, such polyhouse also much have mesh covered side ventilators on both the sides with an option to cover by rolling a layer of polythene cladding material. Occasional rise in temperature for a few days in summer can be easily managed by operating both the ventilation systems. Besides operating the crop level misters, fogger or micro sprinklers, high temperatures in a polyhouse in hot season can also be minimized by applying a layer of lime on the top of polyhouse. Crop management and other factors of greenhouse cultivation are highly intensive and technically in nature necessitating the availability of advanced knowledge to the growers. Keeping this in view the present experiment has been planned. In order to expand the area under rose cultivation and to promote the farmers towards the rose farming in protected cultivation an experiment was planned.

METHODOLOGY

Experimental details:

The experiment was planned in poly house for the rose cv. PASSION (red) with three levels of fertilizers supplied through drenching with a control level of fertigation.

Treatments:

Treatments consisted of three levels of fertilizer supplied through drenching with a control level of fertigation.

F_1 = 100 per cent K_2O regular farmer practice (control) (33.06 ppm)

F_2 =20 per cent increase of K_2O over regular farmer practice supplied through drenching (39.67 ppm),

F_3 =40 per cent increase of K_2O over regular farmer practice supplied through drenching (46.28 ppm),

F_4=60 per cent increase of K_2O over regular farmer practice supplied through drenching (52.89 ppm)

Design specifications:

- Type of polyhouse : Partially controlled naturally ventilated polyhouse
- Design : Completely Randomized Design (CRD)
- Number of replications : 12

Fertigation:

Fertilizer application : Through fertigation unit
Fertilizer dose : Regular farmer practice
Fertigation unit : TALGIL Company, Israel

Hydroponic system:

The media used for the plant growth was coco peat *i.e.* soil less culture.

Irrigation:

Irrigation was applied through atomized drip irrigation. The irrigation scheduling was maintained so that the drip drain ratio should not exceed 33 per cent.

Many empirical equations were available for calculation of water requirement for rose cultivation on bed but for the pot cultivation 1.02 to 2.5 mm depth of irrigation water was sufficient from winter to summer season (Caballero *et al*., 1996).

Fertilizer application:

The fertilizers were given through fertigation unit. Basal dose was given in terms of regular farmer practice. The levels of fertilizer application were adjusted by supplementary addition of fertilizers through drenching. The concentrated K_2O solution was given through beaker to the plants.

Vase-life study:

The fully developed flower bud of rose, when the sepals curled back and outer one or two petals stated unfolding were selected randomly and harvested from each treatment. Immediately after harvesting, the cut flowers were dipped with their cut ends into the water in bucket. Latter the flower stalks were cut at 30 cm length. Then two solutions were prepared *i.e.* T_1 – plain water (100 ml), T_2 plain water (100 ml) + sugar (1 g). The cut flowers with top leaves were held in 100 ml measuring cylinder containing tap water in the laboratory. Daily 0.5 cm of the bottom part of flower stalk was cutout to prevent vascular blockage to tissues.

The end of vase-life of cut flowers was ascertained by the appearance of bent neck or wilting or fading of petals. The vase life of cut flowers was recorded in days from the date of harvest till the end of vase-life and the mean was calculated for each treatment.

Water requirement:

The water requirement was calculated on the basis of drip drain ratio. It was worked out by measuring the water in beaker at dripper point and at the drain point. The volume of water was measured in ml. The percentage drip drain ratio was worked out as

$$\text{Drip-drain ratio (\%)} = \frac{\text{Drain volume (ml)}}{\text{Drip volume (ml)}} \times 100$$

Economics of cultivation:

The economics of cultivation in protected cultivation was an important factor due to its high initial investment. The economics of cultivation was consisted of fixed cost and operational cost. Firstly total cost of cultivation in Rs. was calculated and further total cost per year was calculated considering depreciation value and interest value. The receipt per year was calculated taking into account total flower production per year. Economics of cultivation was calculated and benefit cost ratio was generated per year basis.

RESULTS AND DISCUSSION

The observations on average number of branches per plant were noted.The observations recorded showed that the treatments F_4 was found with maximum number of branches. However, treatment F_3 (3.66) was at par with F_4. The minimum number of branches was observed in treatments F_1 (control) and it was 3.28. In the present study, the treatment F_4 was found with maximum leaf area. However, the minimum leaf area was observed in treatment F_1(control). The treatment F_3 had flowers with maximum stalk length of 71.28 cm. However, treatments $F_4$with stalk length 71.08 cm at par with F_3. The minimum stalk length was observed in treatment F_1 (control) and it was 67.89 cm. The minimum girth of flower stalk was observed in F_1(control). The diameter of flower differed significantly among different levels of treatments. Increased K_2O level resulted in increasing root bio mass which resulted in more absorption of water and nutrients supplied through drip irrigation which there by resulted in increasing all the growth parameters in roses resulted in increasing the diameter

of flower. From the data, it was observed that treatment F_4 was found with maximum number of petals per flower. However, treatment F_3 was observed with 22.20 numbers of petals per flower which was second highest after F_4. The treatment F_1 (control) was observed with minimum number of petals per flower and it was 21.54.

The data with respect to study of vase life (days) were recorded and presented in Table 1.

Table 1 : Study of vase-life (days)

Solution Treatments	Vase life (Days) T_1	T_2
F_1 (control)	5.48	6.21
F_2	7.67	8.12
F_3	9.52	10.27
F_4	11.67	12.08
S.E ±	0.302	
C.D. (P=0.05)	1.186	

From the Table 1, it was noticed that, the maximum vase life was observed in treatment F_4 with solution containing plain water (100 ml) and sugar (1g) and it was 12.08 days. The second maximum value was observed in treatment F_4 with plain water and it was 11.67 days. The minimum vase-life was observed in treatment F_1 (control) with plain water and it was 5.48 days.

Water requirement:

The observations on calculation of water requirement of rose plants in poly house condition were noted and presented in Table 2.

Table 2 : Water requirement

Sr. No.	Month	Water requirement ml/pot/day
1.	February	495.10
2.	March	596.38
3.	April	696.70

The water requirement was calculated on the basis of drip-drain ratio percentage. It was calculated in the form of volume of water collected at dripper and it was given in ml/ pot/day.

The water requirement calculated in the month of February was 495.10 ml/ pot/ day. The water requirement calculated in the month of March was 596.38 ml/ pot/ day. The water requirement calculated in the month of April was 696.70 ml/ pot/ day.

The cost per year included fixed cost per year and operational cost per year. The fixed cost per year remained same in all the treatments. The operational cost per year was changed because of level of K fertilizers was changed. The obtained operational cost per year was increased because of increased in level of K fertilizers. The total cost per year in treatment F_1(control) was obtained minimum and it was Rs. 338823 and the treatment F_4 obtained with Rs. 354531 total cost per year which was maximum. The total cost per year of treatments F_2 and F_3 was obtained Rs. 344055 and Rs. 349311, respectively (Table 3).

Table 3 : Economics of cultivation per year per treatment

Sr. No.	Treatments	Cost per year (Rs.)	Receipt (Rs.)	Benefit-Cost ratio
1.	F_1 (control)	338823	425000	1.25
2.	F_2	344055	437500	1.27
3.	F_3	349311	462500	1.32
4.	F_4	354531	463250	1.30

In economics point of view, the treatment F_3 was found to be superior because it has B:C ratio 1.32. The treatment F_4 produced more receipt but its cost per year was also more. So the treatment F_3 was superior among all the treatments. Similarly Singh (2006) conducted an experiment with farm yard manure, *Azotobacter* and nitrogen to know the effect on leaf nutrient composition, growth, flowering and yield in rose.

Conclusions:

The treatment which was consisted of 60 per cent increase of K_2O over regular farmer practice supplied through drenching was found superior in number of branches per plant, leaf area, diameter of flower, number of petals per flower, weight of flower, number of flowers per plant, number of flower per m^2, number of flowers per treatments, vase life over rest of the treatments. However, treatment which was consisted of 40 per cent increase of K_2O over regular farmer practice supplied through drenching was found superior in flower stalk length, girth of flower stalk over rest of the treatments.

The water requirement for rose cv. PASSION was obtained in February 495.10 ml/pot/day March 596.38 ml/pot/day and in April 696.70 ml/pot/day in polyhouse condition.

The cost of economics point of view the treatment which was consisted of 40 per cent increase of K_2O over RFP supplied through drenching was found superior because it had a more BC ratio over rest of the treatments.

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