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Influence of different levels of NPK on growth, yield and quality of phalsa (*Grewia subinaequalis* L.)

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ABSTRACT : An experiment was conducted to study the influence of different levels of nitrogen, phosphorus and potash on vegetative growth, yield and quality of phalsa (*Grewia subinaequalis*) during the year 2011-2012 at the Horticulture Research Farm, Sam Higginbottom Institute of Agriculture Technology and Sciences, Allahabad. The results revealed that the maximum number of canes (13.41)/bush, number of sprouted shoots (22.12) per cane, number of fruiting nodes (16.95) per shoot, average number of fruits (5273.98)/bush, fruit yield (4.42kg.)/bush, total yield (73.59 q/ha), total Sugar (10.69%) and lowest titratable acidity (2.45) were recorded in T_7=100g N+50g P_2O_5+100g K_2O/bush. Moreover the highest length of new shoots (68.56cm) /cane and TSS (22.10 ^{0}Brix) were noticed in T_8=150N+100g P_2O_5+150g K_2O/bush.

KEY WORDS : Phalsa, Nitrogen, Phosphorus, Potash

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Phalsa (*Grewia subinaequalis* L.) also known as star apple is a subtropical fruit native to India and belongs to family Tiliaceae. It is commercially grown in arid and semi-arid regions because of its hardy nature and capacity to tolerate high temperature and even grown under prolonged dry with little care. It is bushy in nature and bears small berry like fruits of deep reddish brown colour. It has pleasing flavour and cooling effect which makes it popular in the hot season. Ripe fruits are sub acidic and good source of vitamin 'A' and vitamin 'C'. They are also fair source of phosphorus and iron. Fruit contain 50-60% juice 10-11% sugar and 2.0-2.5% acid. The fruits are used for making excellent juice and squash, it is also used as table fruit by children. However, its fruits are good source for preventing heart disease and blood diseases. Phalsa is a small bushy type of plant and they require nutrients for increase production and improve the fruit quality. Shourbagy and Ismail (1984) reported that the number of cluster and yield were increased with the application of phosphorus. Nitrogen is an essential constituent of the protein and chlorophyll, and it is present in many other compounds of great physiological importance in plant metabolism, such as nucleotides, phospholipids, alkaloids, enzymes. Phosphorus plays an important role in cell division and increase photosynthetic activity which might be the reason for favourable effect on plant growth, luxury and consumption. Potassium reduces the magnesium uptakes which eventually have adverse effect on photosynthesis. NPK increases fruiting and quality in guava reported by Kumar *et al.* (2008).

RESEARCH METHODS

The present investigation was carried out at the Research Farm, Department of Horticulture, Allahabad School of Agriculture, Sam Higginbottom Institute of Agriculture Technology and Sciences, Allahabad during the year of 2011-2012. Location of research field was 25.57^0 North latitude and 49.61.50^0 East longitude and at an altitude of 98 m above mean sea level. The experiment was laid out in Randomized Block Design with 9 treatments and replicated three times. Treatments comprised of combinations [T_0 = Control (without

any fertilizers); T_1=100gN/bush;T_2=150gN/bush; T_3=50g P_2O_5/bush; T_4=100g P_2O_5/bush; T_5 = 100g K_2O/bush; T_6 = 150g K_2O/bush; T_7 = 100g N + 50g P_2O_5 + 100g K_2O/bush and T_8 = 150 N + 100g P_2O_5 + 150g K_2O/bush]. The allocation of treatment to the individual plots was done using random number in each replication. All cultural practices were done time to time in research field. Amongst all the cultural practices in phalsa cultivation, pruning is one of the needful cultural practise for increasing the production and productivity. In this experiment pruning was done in December with the help of secateur by manual labour. All the pruned canes were almost similar in diameter; the average diameter per cane was 1.08 cm. The sources of nitrogen, phosphorus and potash were urea, diammonium phosphate and murate of potash, respectively. Half of the nitrogen and full dose of phosphorus and potassium were applied in the second week of February and the remaining half dose of nitrogen was applied in mid April. Irrigation was applied after every dressing of fertilizers. The observations were recorded on number of canes/bush, number of sprouted shoots/cane, fruiting nodes per shoot, length of new shoot(cm), average number of fruits per bush, fruit yield per bush (kg), fruit yield (q/ ha), total soluble solids of fruit , total sugar and titratable acidity(%). Fruit weight was measured with the help of digital balance. The total soluble solid (TSS) of the juice was recorded with the help of hand refractometer (0-32^{0}B). Tatratable acidity and total sugar were measured by A.O.A.C. (1995) method.

RESEARCH FINDINGS AND DISCUSSION

The results recorded in Table 1 from the present investigations have been summarized under following sub heads:

Effect on yield attributes:

The maximum number of canes (13.41)/bush, number of sprouted shoots (22.12)/cane, number of fruiting nodes (16.95)/shoot, average number of fruit (5273.98) per bush, fruit yield (4.42kg)/bush and total yield (73.59 q/ha) were recorded in T_7=100gN+50gP_2O_5+100gK_2O/bush. Whereas, the minimum number of canes (8.40)/bush, no of sprouted shoots (9.60)/ cane, number of fruiting nodes (9.32)/shoot, length of new shoots (59.09cm), average number of fruit (1781.86) per bush, fruit yield (1.34kg) per bush and total yield (22.51) q/ ha were recorded in control. It was noticed that inorganic fertilizers are beneficial to increase the growth, yield attributes of Phalsa. Similar results were recorded by Nijjar and Chand (1989). It might be due to the reason that nitrogen is a major nutrient which is responsible for carrying out several metabolite activities in plant and influencing the vegetative growth of plant and in turn increased number of flowers. These results are in agreements with the finding of Nijjar and Rehalia (1977). Moreover, maximum length of new shoot (68.56cm) was noticed in 150N+ 100g P_2O_5+150g K_2O/bush. The increase in shoot growth may be due to enhanced availability of nutrients and production of promoting substances that might have caused cell elongation and multiplication, number of leaves be attributed to the solubilization effect of nutrients by addition of NPK. Similar results were noticed by Shinde *et al.* (1976).

Effect on fruit quality :

The highest total sugar (10.69%) and lowest acidity (2.45%) were recorded in T_7=100gN+50gP_2O_5+100gK_2O/ bush per plant. Meanwhile the lowest total sugar (8.18%), TSS (19.10 ^{0}Brix) and highest acidity value (2.91%), was recorded in control. Moreover, maximum TSS (22.10 ^{0}Brix)

Table 1 : Influence of different levels nitrogen, phosphorus and potash on growth, yield and quality of phalsa (*Grewia subinaequalis*)

Treatments	No. of canes/ bush	No. of sprouted shoot / cane	No. of fruiting nodes/ shoot	Length of new shoot (cm)	Average no. of fruit/bush	Yield / bush (kg)	Yield (q/ha)	TSS	Total sugar (%)	Acidity (%)
Control	8.40	9.60	9.32	59.09	1781.86	1.34	22.51	19.10	8.18	2.91
100g N/bush	9.52	10.69	11.79	63.04	2111.24	1.97	32.28	19.68	9.02	2.61
150g N/bush	11.21	19.04	15.29	66.4	4685.20	3.61	60.32	20.37	9.84	2.72
50g P_2O_5/bush	10.26	12.53	13.70	64.49	3514.96	1.83	30.19	20.27	8.83	2.53
100g P_2O_5 / bush	9.71	14.61	12.14	62.01	4308.92	1.82	30.01	20.36	9.53	2.57
100g K_2O/bush	11.71	15.71	11.66	63.51	4076.00	2.86	47.32	19.36	9.44	2.64
150g K_2O/bush	10.49	12.04	14.07	66.21	5092.55	2.46	41.45	19.64	9.17	2.68
100gN+50gP_2O_5+100gK_2O/bush	13.41	22.12	16.95	67.34	5273.98	4.42	73.59	20.81	10.69	2.45
150N+100gP_2O_5+150gK_2O/bush	12.69	21.18	15.97	68.56	5117.97	3.81	64.00	22.10	10.50	2.87
F-test	S	S	S	S	S	S	S	S	S	S
S.E. (±)	0.13	0.21	0.24	0.22	23.78	0.028	0.45	0.19	0.016	0.008
C.D. (P=0.05)	0.23	0.37	0.43	0.38	41.86	0.049	6.80	0.33	6.028	0.014

was noticed in T_8 =150N+100gP_2O_5+150gK_2O/bush. These results are in agreement with those reported earlier by Singh and Singh (1999) and Mahalle *et al*. (2001). Inorganic fertilizers increase fruit quality of phalsa (Sharma *et al*., 2008). The significant improvement in quality of traits like TSS, total sugar and lowest titrable acidity was may be due to the known fact that NPK are capable of supplying adequate macro plant nutrients which play major role in quality improvement through desirable enzymatic change taking place during growth of the plants. Similar results were reported by Mahendran and Kumar (1997) in cabbage and Wijsmuller (1989) reported that NPK treated plants increase fruit quality.

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