

Response of *Solanum viarum* to phosphorus and potassium application

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ABSTRACT

A field experiment was conducted during the rainy season of 1995–96 and 1996–97 to study the response of 'Arka Sanjeevini' *Solanum viarum* Dunal to graded levels of phosphorus and potassium application. The maximum dry berry yield of 3.84 tonnes/ha (mean of 2 years) was obtained at 60 kg P₂O₅ and 3.93 tonnes/ha at 40 kg K₂O/ha because of higher weight of berries/plant observed in the same treatments. This was followed by 90 kg P₂O₅ and 60 kg K₂O/ha application. The improved variety responded more to potassium than to phosphorus application.

Key words : *Solanum viarum*, Phosphorus, Potassium

Solanum viarum yields solasodine, a nitrogen analogue of diosgenin, whose hormonal derivatives are used in cortico steroid industry as an active ingredient of contraceptive pill. The IIHR, Bangalore, developed a high-yielding spineless variety 'Arka Sanjeevini' which contains about 1.6% extractable solasodine and suitable for high density planting (1, 11,000 plants/ha). It is being cultivated in Maharashtra and Karnataka. Crush (1963) showed that different levels of NPK significantly influenced solasodine content in *S. laciniatum*. Chaudhari *et al.* (1979) recorded a marginal increase in solasodine content under heavy fertilization. However, no information is available about

the response of new variety to phosphorus and potassium application. Therefore, the present study was carried out to optimize the levels of phosphorus and potassium in *Solanum*.

MATERIALS AND METHODS

The field experiment was conducted during 1995–96 and 1996–97 at Indian Institute of Horticultural Research, Bangalore. The soil was sandy clay loam with pH 6.2 and 0.2 dS/m electrical conductivity. Soil was medium in organic carbon (0.5%) and available potassium. But available nitrogen (210 kg/ha) was low. Five levels of phosphorus, viz. 0,30,60,90 and 120 kg P₂O₅/ha, and 4 levels of

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potassium, viz. 0, 20, 40 and 60 kg K_2O /ha) were tried in randomized block design with 3 replications. *Solanum* nursery was raised in June and about 2-month-old seedlings were transplanted during the second week of August in the first year and last week of August in the second year, at a spacing of 120 cm $\times$ 30 cm. Required quantities of nitrogen, phosphorus and potassium were applied to the experimental plots as per the treatments. Various growth and yield observations were made at the time of harvest in January. The berries were dried under the sun for 10–15 days in the field, yield/plot was recorded and yield/ha was calculated.

RESULTS AND DISCUSSION

Growth parameters

Application of phosphorus at higher levels significantly increased branches/plant and leaf-area index (Table 1). In the second year, plant height was significantly highest with 120 kg P_2O_5 /ha, but was on par with other treatments except the control. However, mean of 2 years indicated that the plant height increased only up to 60 kg P_2O_5 /ha. Similarly, potassium application at 60 kg K_2O /ha also significantly increased the mean plant height, branches/plant and leaf-area index. As far as leaf-area index is considered, it increased linearly up to 60 kg K_2O /ha. These parameters showed a linear response to phosphorus and potassium application except number of branches to potassium application. Even the interaction of 60 kg P_2O_5 and 40 kg K_2O /ha recorded higher plant height. The mean data indicated that application of phosphorus increased the number of branches

from 3.9 to 4.7/ plant and leaf-area index from 1.26 to 2.00 over the control. Probably the higher levels of phosphorus along with 90 kg nitrogen and 60 kg potassium might have resulted in balanced nutrition of the crop, thus producing better growth. *Solanum* responds to the increasing levels of nitrogen application in terms of growth characters (Sreekandan Nair, 1984).

Yield and yield attributes

Data on number of fruiting points/plant, number of fruits/plant, fresh fruit weight density of fruits and dry berry yields are presented in Tables 1 and 2. The mean number of fruiting points (axils on which fruit are borne)/plant was maximum at 60 kg P_2O_5 /ha, followed by 30 kg P_2O_5 /ha which did not differ significantly in both the years (Table 1). With potassium application, the mean fruiting points/plant were highest at 60 kg K_2O /ha followed by 40 kg K_2O /ha and showed significant differences in both the years. Application of 60 kg K_2O /ha recorded the maximum number of fruits compared with the control (Table 2). Mean fruit weight increased with phosphorus application till 60 kg K_2O /ha and declined thereafter. The differences were significant only in the second year with the same treatment, recording significantly higher fruit weight than the control. With respect to potassium application mean fresh weight/plant was highest at 40 kg/ha, followed by 60 kg K_2O /ha. The treatments differed significantly in both the years, showing the same trend as that of mean fresh weight. It was interesting to observe that the control plots recorded higher density than the plots treated with phosphorus

Table 1. Growth and yield components of *Solanum* as influenced by P and K fertilization

Treatment	Plant height (cm)	Branches/plant	Leaf-area index	Fruiting points/plant
	1995-96	1995-96	1995-96	1995-96
	Mean	Mean	Mean	Mean
0	76.0	3.9	1.41	40.0
30	85.6	4.5	1.73	47.2
60	87.8	5.0	1.85	47.8
90	87.3	4.1	1.97	46.7
120	89.1	5.1	1.88	42.5
	NS	NS	NS	NS
CD (P = 0.05)	103.7	0.42	0.32	10.52
0	98.6	4.0	1.11	43.9
30	100.1	4.5	1.77	46.1
60	107.0	5.0	1.81	47.4
90	100.2	4.1	1.92	46.2
120	103.7	4.3	1.86	48.8
	NS	NS	NS	NS
CD (P = 0.05)	109.1	0.37	0.44	50.4
0	76.1	3.7	0.91	38.2
30	86.8	4.7	1.66	51.3
60	86.7	4.7	1.71	48.6
90	95.7	4.2	2.25	49.5
120	91.1	5.0	2.20	45.2
	NS	NS	NS	NS
CD (P = 0.05)	109.1	0.42	0.28	7.61

Table 2. Yield and yield components of *Solanum* as influenced by P and K fertilization

Treatment	Fruits/plant	Fresh fruit (tonnes/ha)	Density of fruits (g/cc)	Dry berry yield (tonnes/ha)
	1995-96	1995-96	1995-96	1995-96
	Mean	Mean	Mean	Mean
0	68.9	535.4	0.981	3.09
30	85.6	654.8	0.835	3.63
60	83.6	669.6	0.792	3.93
90	74.9	539.3	0.821	4.14
120	74.9	516.9	0.690	3.35
	NS	NS	NS	NS
CD (P = 0.05)	64.9	633.1	0.814	3.45
0	64.2	438.5	0.828	3.17
30	70.9	494.1	0.708	3.58
60	68.5	543.8	0.751	3.75
90	73.8	528.1	0.756	3.13
120	85.0	442.9	0.692	3.35
	NS	NS	NS	NS
CD (P = 0.05)	61.9	395.3	0.677	2.96
0	52.1	420.1	0.918	2.66
30	71.7	502.4	0.811	3.62
60	74.4	535.6	0.712	3.85
90	75.8	515.7	0.691	3.90
120	72.4	58.7	0.006	0.68
	NS	NS	NS	NS
CD (P = 0.05)	20.82	132.6	0.024	0.72

and potassium fertilizers in the first year. However, in the second year the density increased with increasing levels of potassium.

The maximum mean dry berry yields was observed with 60 kg P_2O_5 and 40 kg K_2O /ha. The significant differences were noticed only with application of potassium and not with the phosphorus application, showing the same trend as that of mean data. For realization of optimum yields in *Solanum* variety 'Arka Sanjeevini', one can adopt fertilizer schedule of 90 kg N, 60 kg

P_2O_5 and 40 kg K_2O /ha, as evident from the present investigation.

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