Effect of foliar spray of potassium nitrate and calcium nitrate on grasspea (*Lathyrus sativus* L.) grown in rice fallows.

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Introduction

Of 21.04 million ha rainfed lowland rice areas in South Asia, India occupies 16.7 million ha, where photosensitive traditional rice is grown during June-July to November-December every year. Following the harvest of rice, the majority of land remains fallow till the next rice in the following year for a large number of agro-economic factors.

However, there is a possibility of raising another crop as a *paira* crop in a relay cropping system before the harvest of rainfed lowland rice. Grasspea is suitable for relay cropping with paddy rice [(1)] and it has potential among grain legumes for its tolerance to dry conditions and its adaptibility to unfavourable environments [(2)]. Since grasspea in relay cropping with rice suffers from nutrient stresses during the reproductive phase, late application of N is effective in reducing flower and pod drop in legume and in increasing seed yield [(3)]. Legumes, in general, require K[(4)] and Ca[(5)]. This study, therefore, was initiated to investigate the effect of foliar spray of potassium nitrate and calcium nitrate on a *paira* crop of grasspea grown in rainfed lowland rice fallows.

Materials and Methods

The field experiment was conducted during the late winter season of 1998 and 1999 at the Experimental Farm of Calcutta University, Baruipur, West Bengal, India (88.28° E, 22.22° N and approximately 1 m above sea level). Soil was Gangetic alluvial (Entisol), having 0.72% organic carbon, 22 kg available P_2O_5/ha and 240 kg available K_2O/ha with pH 6.2. The experiment was set in rice fallows, with paira crop of grasspea by broadcasting grassspea seeds just before harvest of wet season photosensitive rice (cv. Rupsail). The experiment was a randomised block design with three replications. The treatments consisted of foliar spray of potassium nitrate, calcium nitrate, water spray and control (Table 1). The foliar sprays of potassium nitrate (KNO_3) and calcium nitrate ($Ca(NO_3)_2$) were given at 3 concentrations, supplied equal amounts of N (as NO_3^-) in the respective treatments (Table 1). The seeds of grasspea (cv. Nirmal I) at 60 kg/ha were broadcast uniformly, 10 days before harvest of the physiologically mature rice crop, over the field under muddy conditions. In both years this was carried out in the second fortnight of November without any tillage operations.

Starter nitrogen, basal phosphorus and potassium were applied, broadcast at 20 kg/ha each of N, P_2O_5 and K_2O a day after seed sowing. Dilute solutions of nutrient salt as per treatment were applied at 800 litres of water/ha as a foliar spray during 50% flowering stage of the crop. Data were recorded on 10 random plants for yield attributes, seed yield from plot, treatment wise. The rainfall received during the crop duration in 1998 and 1999 was 54 and 46 mm, respectively.

Results

Foliar spray of KNO_3 and $Ca(NO_3)_2$ salts exerted conspicuous effects on yield attributing characters of grasspea (Table 1). Foliar spray of KNO_3 at 0.50% during 50% flowering stage showed maximum values of pods/plant, length of pod, seeds/pod and 1000 seed weight; it was significantly superior to water spray and unsprayed control, but was on par with $Ca(NO_3)_2$ at 0.406%.

KNO_3 at 0.50% when sprayed during 50% flowering stage while equivalent to $Ca(NO_3)_2$ at 0.406%, recorded a significantly and appreciably higher seed yield than spray of KNO_3 at 0.25 and 1.00%, $Ca(NO_3)_2$ at 0.203 and 0.812%, water spray and unsprayed controls. This was the case in both years and also in the pooled data (Table 1). The increase in seed yield due to spraying of KNO_3 at 0.50% at 50% flowering stage was 78.4 and 85.7% over the water sprayed and controls, respectively, on a pooled basis.

Table 1. Effect of foliar spray of KNO_3 and $Ca(NO_3)_2$ on yield attributes and yield of grasspea grown as a *paira* crop (pooled data for 2 years, 1998 and 1999).

Treatment	Pods /plant	Pod length (cm)	Seeds /pod	1000 seed weight (g)	Seed yield /plant	Seed yield (t/ha) 1998	1999	Pooled
Control	15.34	2.1	1.90	126.0	5.84	0.49	0.48	0.49
Water	16.70	2.4	2.25	127.3	6.10	0.50	0.53	0.51
KNO_3 (0.25%)	18.68	2.9	3.34	135.4	7.28	0.82	0.76	0.78
KNO_3 (0.50%)	21.75	3.6	4.14	149.5	8.89	0.89	0.93	0.91
KNO_3 (1.00%)	19.80	3.2	3.75	141.6	8.21	0.84	0.80	0.82
$Ca(NO_3)_2$ (0.203%)	18.29	2.7	3.25	132.3	7.19	0.74	0.76	0.74
$Ca(NO_3)_2$ (0.406%)	19.88	3.4	3.90	143.2	8.28	0.86	0.82	0.84
$Ca(NO_3)_2$ (0.812%)	18.90	3.1	3.69	139.6	7.96	0.77	0.81	0.79
LSD ($P<0.05$)	0.99	0.45	0.23	1.12	0.09	0.36	0.01	0.25

Discussion

Grasspea in a relay cropping system with rainfed lowland rice responded favourably to foliar spray of KNO_3 and $Ca(NO_3)_2$. Improvement in yield attributes of grasspea due to foliar spray of KNO_3 at 0.50% might be attributed to hastened availability of N in the plant system, more chlorophyll synthesis, greater accumulation of protein in plants and efficient translocation of assimilates to reproductive parts.

Foliar spray of KNO_3 at 0.50% during 50% flowering resulted in higher seed yield than other treatments (Table 1). Foliar spray of KNO_3 at 0.50% increased the seed yield by 85.7% over the unsprayed control in pooled data owing to the favourable effect on yield attributes. Spray of KNO_3 at 0.50% during flowering supplied N and K which are effectively absorbed as anion and cation by plants, and might have delayed the synthesis of abscisic acid and promoted cytokinin activity[(6)], causing higher chlorophyll retention. This may secure higher photosynthetic activity in effective leaves and supplied developing pods with current photosynthates for proper filling, resulting in higher yield. Besides the beneficial functions of nitrate nitrogen, the prevalence of K+ in KNO3, might have improved grain filling and phytomass production, due to increasing photosynthetic activity and effective translocation of assimilates to reproductive parts (7) resulting in higher yield. Foliar spray of KNO3 at moderate rate of 0.50% proved more effective than lower (0.25%) and higher rate (1.00%) and all the rates of Ca(NO3)2 supplying equivalent amount of NO3- as in KNO3 for grasspea in rice fallow land.

References

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