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Effect of some pelleting agents and sodium humate as spray on dry matter yield and nutrient uptake of soybean (*Glycine max* L. cv Bragg) in a saline-sodic soil

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Summary

A potculture experiment was carried through to study the effect of pelleting agents, viz. gypsum, dicalcium phosphate, basic slag, and sodium humate as spray, on dry matter yield and nutrient uptake of soybean (*Glycine max* L. cv Bragg) in a saline-sodic sandy loam soil, having *p*H 8.2 and E.C. 2.3 m mhos/cm. at 25 °C. In all the treatments dry matter yield of shoots and roots and their nutrient uptake (N, P, Zn, Fe, Mn, and Cu) was significantly (5% level) higher than that of the control.

In India, several studies (ISWARAN 1969, ISWARAN and JAUHRI 1969, ISWARAN et al. 1970, CHHONKAR et al. 1971, and ISWARAN et al. 1971) reported on the beneficial effect of various pelleting agents on germination, nodulation, N-uptake, and yield of various legumes, grown under unfavourable soil conditions. But no study was carried out on the uptake of both major and micro-nutrients in relation to dry matter yield of soybean. The present potculture experiment is an attempt to investigate the effect of pelleting agents, viz. gypsum, dicalcium phosphate (DCP), basic slag, and soaking of seeds in sodium humate and its spray, on dry matter yield and uptake of N, P, Zn, Fe, Mn, and Cu by soybean cv Bragg, grown in a saline-sodic sandy loam soil of Delhi, having *p*H 8.2 and E.C. 2.3 m. mhos/cm. at 25 °C.

Soybean cv Bragg was planted in pots, containing 5 kg. soil. The treatments included soaking the seeds in sodium humate solution (10 mg./l.) and using its spray (4 times at 2 weeks interval) on the plants, and pelleting the seeds with gypsum, DCP, and basic slag. Sodium humate was prepared as per the method described by KONONOVA (1966). The seeds were pelleted with the amendments as per the method of HASTINGS (1962). The treatments were replicated three times. A basal dose of 100 ppm N, 100 ppm P, 50 ppm K, 25 ppm S, 2.25 ppm Zn, 0.5 ppm B, 0.75 ppm Cu, and 15 ppm Mn was applied to the soil in each pot. Seven seeds per pot were planted on July 18, 1972 and reduced to 3 plants per pot on August 9, 1972. The plants were sprayed with Mo (200 g./ha as ammonium molybdate) on September 11, 1972. On October 10, 1972 the plants were harvested at pre-bloom stage. The roots were recovered by washing. The shoot and root samples were washed in very dilute HCl and distilled water, and then were dried in an oven at 105 °C till constant weight was obtained. Dry matter yield of shoots and roots was recorded. The plant material was ground in a Micro Wiley Mill to pass through a 20 mesh sieve, and was analyzed for N by the Kjeldahl method, as given by JACKSON (1959). One gram of the plant material was digested in a tri-acid mixture. Phosphorus was determined by the vanadomolybdophosphoric yellow colour method (JACKSON 1959). Zinc, Fe, Mn, and Cu were analyzed by an Atomic Absorption Spectrophotometer, model Varian Techtron 120.

In all the treatments (Tables 1 and 2), dry matter yields of shoots and roots were significantly (5% level) higher than that of the control. The dry matter yield of shoots in the case of DCP treatment was significantly (5% level) different from that of sodium

humate and basic slag treatments, whereas it was not significantly (5% level) different from that of the gypsum treatment. Beneficial effect of DCP and gypsum on shoot and root growth may be attributed to better germination and establishment of the plants in the earlier stage of growth. Uptake of N, P, Zn, Fe, Mn, and Cu in shoot and root (Tables 1 and 2) was significantly (5% level) higher in almost all the treatments, as compared to that of the control. It appears that seed-pelleting agents, as well as sodium humate, offset the adverse conditions in problematic soils by providing a better environment for rhizobia to develop and establish in the rhizosphere, which leads to greater efficiency of rhizobia in fixing N, as is indicated by the results. At the same time, greater root growth in the pelleted treatments and sodium humate treatment might have been responsible for increased uptake of the other nutrients. Beneficial effect of humic substances on plant growth and nutrient uptake has recently been reviewed (VIMAL 1972).

Table 1

Effect of some pelleting agents and sodium humate as spray on dry matter yield and nutrient uptake of soybean shoots (Av. of 3 reps.)

Treatments	Dry weight (g./pot)	Uptake (mg./pot) N	P	Zn	Fe	Mn	Cu
Control	2.8	32.4	5.1	0.40	1.56	0.21	0.19
Sodium humate	5.4	87.4	10.3	0.83	2.92	0.37	0.49
Gypsum	5.6	117.7	12.9	0.90	3.15	0.38	0.48
DCP	6.3	109.1	15.7	1.00	3.40	0.37	0.45
Basic slag	4.5	73.4	8.5	0.71	2.43	0.30	0.33
$L.S.D._{.05}$	0.8	23.6	1.6	0.22	0.42	0.05	0.11
C.V.	9.0%	15.5%	8.6%	13.0%	8.7%	6.1%	15.8%

Table 2

Effect of some pelleting agents and sodium humate as spray on dry matter yield and nutrient uptake of soybean roots (Av. of 3 reps.)

Treatments	Dry weight (g./pot)	Uptake (mg./pot) N	P	Zn	Fe	Mn	Cu
Control	1.7	11.0	4.8	0.24	21.25	0.51	0.17
Sodium humate	3.1	26.2	7.0	0.48	33.40	1.00	0.38
Gypsum	3.4	40.7	5.3	0.59	41.91	0.82	0.32
DCP	3.0	28.2	7.5	0.45	40.70	0.68	0.31
Basic slag	2.6	18.4	6.0	0.38	34.06	0.56	0.26
$L.S.D._{.05}$	0.7	7.1	1.5	0.14	15.11	0.21	0.08
C.V.	13.8%	15.7%	13.6%	13.9%	25.9%	15.4%	15.7%

Zusammenfassung

Ein Gefäßversuch wurde durchgeführt, um die Wirkung von Umhüllungsmitteln, wie Gips, Dikalziumphosphat, basische Schlacke und Natriumhumat (aufgesprüht), auf den Ertrag an Trockenmasse und auf die Nährstoffaufnahme bei Sojabohnen (*Glycine max* L. cv Bragg) in einem salzhaltigen sand. Lehmboden (*p*H-Wert 8,2) zu untersuchen. Bei allen Behandlungen war der Ertrag an Trockenmasse bei Schößlingen und Wurzeln sowie ihre Nährstoffaufnahme signifikant höher ($p = 5\%$) als bei den Kontrollpflanzen.

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