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Short Note

Growth and Yield of Soybean as Influenced by Nitrogen and Growth Regulators

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Field experiment was conducted at Millet breeding station, Tamil Nadu Agricultural University, Coimbatore, during *kharif*, 2007 to find out the effect of N and growth regulators on the growth and yield of soybean. The experiment was laid out in a randomized block design replicated thrice. The combinations of three N levels viz., 20kg N ha^{-1} , 30 kg N ha^{-1} and 40 kg N ha^{-1} as basal and three growth regulators viz., Salicylic acid @ 100 ppm, Ethrel @ 100 ppm and Chlormequat chloride @ 200 ppm were the treatments tried. The results of the experiment indicated that application of N @ 20 kg/ha as basal and foliar spraying of salicylic acid @100 ppm recorded significantly better growth, yield parameters and grain yield.

Key words: Soybean, growth regulators, nitrogen, growth, yield.

Soybean (*Glysine max* L.) designated as "golden bean", rich in protein (40%) and moderate in cholesterol free oil (20%) has established its potential as an industrially vital and viable oilseed crop in India. It is grown extensively in Madhya Pradesh, Maharsatra, Rajasthan and in some parts of Karnataka, Uttar Pradesh, Tamil Nadu and Andhra Pradesh as pure and /or inter crop. In India, Soybean is grown in an area of 9.4 million hectares (Anonymous, 2011), accounting for 17 per cent of the total area under pulses, but constitutes only 8 per cent of the total pulse production of the country. This is due to the fact that average productivity of soybean is as low as 1000 kg ha^{-1} in India and the production is likely to increase to 20.0 mt by the year 2025 and it has the potential to bridge the gap between the demand and supply of edible oil and protein.

Growth regulators are organic compounds which, in small amounts, somehow modify a given physiological plant process and rarely act alone, as the action of two or more of these compounds is necessary to produce a physiological effect. They are extensively used to manipulate flower formation and fruit set in horticultural plants. When applied at the pre-blooming stage, increasing vegetative mass which, in turn, shares the photo assimilates with the fruit (Birnberg and Brenner, 1987). This hypothesis is also supported by King *et al*. (2000), who reported greater stem growth in *Fuschia hibrida* and *Pharbitis nil*, resulting in the inhibition of flowering. An attempt was made with different doses of fertilizer N and different growth regulating chemicals as foliar supplementary with a view to increase the yield in Soybean.

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Materials and Methods

A field experiment was conducted at Millet Breeding Station, Tamil Nadu Agricultural University, Coimbatore during *kharif* 2007. Soybean variety CO (Soy) 3 was used as the test crop. The experimental soil was sandy loam in texture having pH 7.8, 0.32% organic matter, 194 kg ha^{-1} of available N, 11.6 kg ha^{-1} of available P, 228 kg ha^{-1} of available K, 5.93 kg ha^{-1} of available S and 4.70 kg ha^{-1} of available B. The experiment was laid out in a randomized block design with 9 treatments replicated thrice consisting of T_1- N 20 kg ha^{-1} (basal) + Salicylic acid @ 100 ppm, T_2 - N 30 kg ha^{-1} (basal) + Salicylic acid @ 100 ppm ,T_3 - N 40 kg ha^{-1} (basal) + Salicylic acid @ 100 ppm ,T_4 - N 20 kg ha^{-1} (basal) + Ethrel @ 100 ppm,T_5 - N 30 kg ha^{-1} (basal) + Ethrel @ 100 ppm,T_6 - N 40 kg/ha $^{-1}$ (basal) + Ethrel @ 100 ppm,T_7 - N 20 kg ha^{-1} (basal) + Chlormequat chloride @ 200 ppm,T_8 - N 30 kg ha^{-1} (basal) + Chlormequat chloride @ 200 ppm, T_9 - N 40 kg ha^{-1} (basal) + Chlormequat chloride @ 200 ppm. The growth regulators were applied as foliar spray, first spray on 30 DAS (peak flowering) and the second on 45 DAS (Pod formation). All the other fertilizers were applied according to the crop production guide (Anonymous, 2004). Seeds were sown @ 60 kg ha^{-1} in line on June 25, 2007. Intercultural operations were done as and when necessary.

Results and Discussion

Dry matter production

Soybean growth in terms of its dry matter production was more pronounced with application of N 20 kg ha^{-1} (basal) + Salicylic acid @ 100 ppm followed by application of N 20 kg ha^{-1} (basal) +

Table 1. Effect of nitrogen and growth regulators on growth, yield attributes and yield of Soybean

Treatment	Dry matter Production(kg/ha^{-1})			No.of seeds/ pod^{-1}	No. of pods/ plant^{-1}	Seed Yield Kg/ha^{-1}	Haulm yield Kg/ha^{-1}
	30DAS	60DAS	90DAS				
T_1. N 20 kg/ha^{-1} (basal) + Salicylic acid @ 100 ppm	446	4478	5688	3.42	60.00	1496	2678
T_2. N 30 kg/ha^{-1} (basal) + Salicylic acid @ 100 ppm	394.	3630	4719	2.58	52.08	1201	2138
T_3. N 40 kg/ha^{-1} (basal) + Salicylic acid @ 100 ppm	423	3442	4689	2.71	44.41	1296	2215
T_4. N 20 kg/ha^{-1} (basal) + Ethrel @ 100 ppm	396	3510	4563	2.31	44.92	941	1675
T_5. N 30 kg/ha^{-1} (basal) + Ethrel @ 100 ppm	445	3547	4740	2.40	51.80	978	1740
T_6. N 40 kg/ha^{-1} (basal) + Ethrel @ 100 ppm	412	3508	4621	2.33	42.79	950	1692
T_7. N 20 kg/ha^{-1} (basal) + Chlormequat chloride @ 200 ppm	389	3386.	4402	2.00	40.74	817	1454
T_8. N 30 kg/ha^{-1} (basal) + Chlormequat chloride @ 200 ppm	436	3204	4166	2.11	41.13	883	1571
T_9. N 40 kg/ha^{-1} (basal) + Chlormequat chloride @ 200 ppm (Foliar spray on 30 DAS)	427	3672	4774	2.42	43.69	985	1753
SEd	21	283	304	0.33	5.08	111	196
CD (p=0.05)	NS	607	653	0.71	10.91	237	421

Ethrel @ 100 ppm both at 60 and 90 DAS. The least dry matter production was noticed with application of N 40 kg ha^{-1} (basal) + Chlormequat chloride @ 200 ppm. The excess dose of N and growth regulators might have led for early senescence. This is in conformity with the findings of Kumar and Neelakandan, (1992).

Yield

The maximum grain yield was recorded in T_1 treatment (N 20 kg ha^{-1} (basal) + Salicylic acid @ 100 ppm) followed by T_3 treatment. The treatments T_2, T_3, T_6 and T_9 registered grain yields of 1201, 1296, 978 and 985 kg ha^{-1} respectively and were comparable. Application of N @ 20 kg ha^{-1}and foliar application of Salicylic acid @100ppm had significantly improved the seed yield of soybean. The increase in yield was due to the increase in the number of pods per plant and higher seeds per pod imparted by the application of fertilizer nutrient and plant growth regulators. Soybean, though produces more number of flowers, most of them get abscised without forming pods. The retention of flowers and pods can be increased by either N application or plant growth regulators as reported by Sharma and Dey (1986) in soybean. The least yield of 817 kg ha^{-1} was recorded in T_5 due to the excess dose of N and growth regulators will might have lead for early senescence

Conclusion

The results revealed that application of N @ 20 kg ha^{-1} and foliar spraying of salicylic acid @ 100 ppm has recorded higher yield of soybean in *kharif* season.

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