Contract Trial Report

Evaluation of "CROPMATE" Microbial Formulation on Nodulation, Growth and Yield of Soybean

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Carried Out By

ICAR-Indian Institute of Soybean Research
Khandwa Road- Indore

Period-Kharif 2015

ICAR-INDIAN INSTITUTE OF SOYBEAN REASEARCH
Khandwa Road- Indore

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Project Tile: Evaluation of "CROPMATE" Microbial Formulation on Nodulation, Growth and Yield of Soybean

Background

"Cropmate" is a formulation containing beneficial Plant Growth Promoting Rhizobacteria (PGPR) which colonizes the roots and promotes plant growth and increase productivity either through direct action or via biological control of plant diseases. Inoculation of this product stimulated directly through increase in nutrition acquisition, such as phosphate solubilization, or more generally by rendering the inaccessible nutrients available to the plants. Also helps in improving crop productivity up to 15 - 20 %.

Present trial was conducted to determine the-

(i) Response of CROPMATE microbial formulation to nitrogen fixation in soybean
(ii) Responses of product on fertilizers use efficiency on soybean

Materials and Methods

The field (Vertisols, soil type, Sarol series) trial was conducted during *Kharif* 2015 at Research Farm of Indian Institute of Soybean Research, Indore. The product **'CROPMATE'** was applied as basal or in split or as seed treatment doses as soil application as per the following treatments-

Treatments

1. Control (Recommended dose of fertilizers (RDF) @ 20:26.2:16.6 kg NPK/ha as basal dose)
2. CROPMATE application as seed treatment @15gm/kg seed along with RDF
3. CROP MATE @ 1kg/acre as soil application along with RDF*
4. CROP MATE Spilt dose (1 Kg/acre soil application at sowing and 1 Kg/Acre at 30DAS +RDF
5. 2 + 3
6. 2 + 4
7. 5 + 75% RDF
8. 6 + 75% RDF

*soil application of CROPMATE to be mixed with FYM@ 20Kg/acre for all the treatments

Soybean Cultivar: **JS 95-60**
Design: RBD
Replications: Three
Plot size: 3.6m × 5m = 18.0 m^2
DOS: 24/06/2015

Sampling and Analyses

Agronomic parameters were recorded during crop stand (soybean JS 95-60) and at harvest. Standard recommended agronomic practices were followed throughout the experimentation to maintain the crop. No weedicides was applied to eradicate weeds; however, weeds were removed by two hand weeding. Number of flowers, nodules per plant was recorded during crop stand and at harvest; total dry biomass of crops (straw + seed) and seed yield were recorded in each plot and extrapolated on per hectare basis. To assess the efficacy of product, the total nitrogen and phosphorus was assessed both in seeds and shoot/straw samples using standard procedures.

The data were analyzed using the analysis of variance. The least significant differences (LSD) were used to separate the treatment means using DMRT test (COSTAT statistical software, Cohart, Berkeley, California).

OBSERVATIONS

1. At emergence, % germination
2. Flower initiation (Day to flower) & Number of flower/plant
3. Shoot biomass per plant at 50% flowering
4. Nodule number; Nodule dry weight & N content of the nodule/ ARA
5. N, P content in the seed & straw at harvest
6. Protein content in seeds
7. Grain yield /per acre
8. Visual observations on biotic and abiotic stresses during the trial

Results

Based on ANOVA, the results can be summarized as follows:

Overall, by and large the germination percentage did not have any significant effect due to application of Cropmate. However, out of all treatment combinations, the plots received combined application as seed treatment, soil or and with split application along with recommended dose of fertilizers had higher emergence/germination (T5 & T6; Table 1) over others. The flower number wasn't found to be significantly affected by the treatment of CROPMATE.

The shoot biomass was maximum in case of combined of seed treatment and soil application of CROPMATE (T5) and minimum when only seeds were treated with the product along with recommended dose of fertilizers (T2).

The nodule number, nodule dry weight, N in nodule and seeds and seed protein was influenced due to application of Cropmate when compared to RDF alone. The maximum response was obtained when the product was applied either as seed treatment or combined with soil application. The efficacy of combined application at 75% RDF was comparable with 100% RDF application. The nitrogen content of straw was found to be higher in the plots where product was applied either as seed treatment or split application and its combined use over the others. Also the N content of straw of Cropmate plants grown at 75% RDF was comparable with 100% RDF plants. The P content in seeds and straw did not influence significantly by the application of Cropmate.

The Grain yield did not vary significantly in any of the treatments. However, soil application and combined application with seed treatment produced highest grain yield amongst other combinations. Noteworthy, the combined application of product as seed treatment either with soil application or split application at 75% RDF produced comparable yields with that of 100% RDF. It means application of Cropmate can save 25% uses of NPK fertilizers without compromising of soybean grain yield.

Visual observations on biotic and abiotic stresses during the trial

Due to heavy rain before the commencing to R1 stage and later dry spell prevailed has reduced the soybean yield. Besides abiotic stress, during flowering stage, sporadic infection of YMV (about 10-15%) and whitefly at R5 stage was noticed across all the plots.

Conclusion: Application of Cropmate either soil application alone or combined with seed treatment produced higher grain yield and may help in saving of 25% NPK fertilizers.

Table.1: Effect of Cropmate on nodulation, N & P uptake, accumulation in seeds and grain yield of soybean (JS 95-60) under field conditions

Treatment	% Germination	No. of flowers /plant	Shoot biomass (g/plant)	Nodule number /plant	Nodule Dry weight (g/plant)	% N in nodule	% N in seed	% P in seed	% N in straw	% P in straw	% Protein in seeds	Grain Yield (kg/ha)
T1	31.74ab	22.4a	3.3abc	25.3a	0.087a	3.92f	6.63bc	0.56a	0.79c	0.15a	38.43bc	788.51a
T2	24.12b	22.8a	2.73c	39.99a	0.152b	4.48ab	6.58bcd	0.48a	1.07a	0.14a	38.16bcd	793.51a
T3	24.78b	20a	3.4ab	30.99ab	0.122bc	4.03ef	4.06e	0.56a	0.78c	0.16a	23.55e	**838.14a**
T4	28.09ab	19.1a	3.4ab	38.83a	0.107c	4.06ef	6.07a	0.62a	1.08a	0.15a	58.19a	725.36a
T5	37.61a	23.33a	3.5a	40a	0.225a	4.25cd	6.06d	0.56a	0.92bc	0.16a	35.19d	**838.89a**
T6	35.24ab	21.33a	2.8bc	34.11a	0.112c	4.605a	6.77b	0.56a	1.04ab	0.14a	39.25b	745.18a
T7	26.03ab	19.93a	2.8bc	35.16a	0.115bc	4.33bc	6.11cd	0.60a	0.854c	0.14a	35.46cd	**778.88a**
T8	28.89ab	20.53a	2.9abc	24.97a	0.063a	4.13de	4.25e	0.56a	0.861c	0.13a	23.55e	**796.11a**
LSD (0.05)	10.69	5.54	0.57	8.12	0.036	0.183	0.51	0.17	0.144	0.04	2.95	193.28

*Data are average of three replications; LSD, least significance different; Means followed by same letter did not differ significantly by DMRT (ANOVA, P=0.05)

T1=RDF, recommended dose of fertilizers (RDF) @ 20:26.2:16.6 kg NPK/ha as basal dose; T2= CROPMATE application as seed treatment @15gm/kg seed along with RDF; T3= CROP MATE @ 1kg/acre as soil application along with RDF; T4= CROP MATE Spilt dose (1 Kg/acre soil application at sowing and 1 Kg/Acre at 30DAS +RDF; T5=T2+T3; T6=T2+T4; T7=T5 + 75% RDF; T8=T6+ 75% RDF

Signature of PI

(Name and Designation)
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