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Study of the effect of different types of fertilizers and manures on the growth of the two varieties of soybean namely PK 416 and Bragg

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In the present experiment Study of the effect of different types of fertilizers and manures on the growth of the two varieties PK 416 and Bragg was conducted in laboratory and field experiments were carried out to standardize the safe priming duration for the two varieties of soybean namely PK 416 and Bragg. The field experiment was conducted in the lawn of the house situated on Bye Pass Road Chapra Saran Bihar due to paucity of land area in the department and the Laboratory experiments were performed in the department of Botany, J. P. University Chapra. This experiment was designed to have an idea of the effect of different types of fertilisers alone and in different combinations on the growth and yield of different cultivars of soybean. Farm yard manure (FYM), Vermicompost (VC) and green leaf manures (GLM) were incorporated three weeks before sowing as per the treatments. The calculated quantity of N, P205 and K20 in the form of urea, single super phosphate and muriate of potash, respectively were applied as per the treatments at the time of sowing.

Keywords: Fertilizers and manures, FYM, VC, GLM

Introduction

Soybean was introduced to India during 1880. Soybean is globally grown over an area of 91.40m. ha. with a production of 204.00 mt and productivity of 2233 kg per ha (Anon., 2007). In India soybean is grown over an area of 8.87 m.ha with a production of 9.46 mt and productivity of 1069 kg per ha which is much below the average productivity of the world (2233 kg/ha). The major soy bean producing states are Madhya Pradesh, Maharashtra, Rajastan, Karnataka, Uttar Pradesh, Andhra Pradesh and Gujarath. Use of organic manures alone or in combination with chemical fertilizers will help to improve physico-chemical properties of the soils, efficient utilization of applied fertilizers for improving seed yield and seed quality. Organic manures provide a good substrate for the growth of microorganisms and maintain a favourable nutritional balance and soil physical properties. It is recognized that combined source of organic matter and chemical fertilizers play a key role in increasing the productivity of soil. The field experiment was conducted in the lawn of the house situated on Bye Pass Road Chapra due to paucity of land area in the department and the Laboratory experiments were performed in the department of Botany,J.P.University Chapra.

Measurements :

The height of the plant was measured and number of leaves were counted. Leaf Relative Water Content (LRWC) was calculated with 10mm disks in diameter. It was calculated by the formula- LRWC = [(FW- DW)/TW-DW)]×100, where

FW is the fresh weigh,

TW is the turgid weight measured after 24 h of staturation on deionised water and DW is the dry weight determined after 48 h in an oven at 80^0C as recommended by (Slavick, 1979). It was carried out after the washing of the root with distilled water and drying it by placing in between filter papers. The plants were divided into shoot and root before the weight and measurements were taken. The number of filled and unfilled pods and number of seed per pod were counted. Good seeds were collected from dried and shelled pods and weighed to represent seed yield. The 1,000-grain weight (g) was determined from the same samples.

A field experiment was conducted at Shaktinagar on Bye pass Road Chapra. There were eight treatments and experiment was laid out in randomized block design with three replications. The objective of the present investigation is the identification of the stage or stages of development in which soybean is most sensitive to drought in this sub humid condition of Bihar.

Material and methods

This experiment was designed to have an idea of the effect of different types of fertlisers alone and in different combinations on the growth and yield of different cultivars of soybean.

Farm yard manure (FYM), vermicompost (VC) and green leaf manures (GLM) were incorporated three weeks before sowing as per the treatments. The calculated quantity of N, P205 and K20 in the form of urea, single super phosphate and muriate of potash, respectively were applied as per the treatments at the time of sowing.

The different treatments planned were following-

T1: Farm Yard Manure (8 t ha-1) + Rok Phosphate (224 kg ha-1)

T2: Vermicompost (4 t ha-1) + Rock Phosphate (176 kg ha-1)

T3: Farm Yard Manure (4 t ha-1) + Vermicompost (2 t ha-1) + Rock Phosphate (200 kg ha-1)

T4: Farm Yard Manure (3 t ha-1) + vermicompost (1.50 t ha-1) + Rock Phosphate (224 kg ha-1)

T5: Farm Yard Manure (5 t ha-1) + Green Leaf Manure (2.60 t ha-1) + Rock Phosphate (240 kg ha-1)

T6 : Vermicompost (3 t ha-1) + Green Leaf Manure (2.60 t ha-1) + Rock Phosphate (240 kg ha-1)

T7 : Recommended Dose of Fertilizer (40 : 80 : 25 kg NPK ha-1) + Farm Yard Manure (5 t ha-1)

T8: Recommended Dose of Fertilizer (40 : 80 : 25 kg NPK ha-1)

The top soil from the field was dug upto a depth of 10 inches from one square metre and the treatments were calculated by adjusting this on acre basis due to paucity of the land area available for the present investigation. The need based irrigation was given to the crop. Randomly five pots were selected and tagged for recording growth, yield and yield parameters. The leaf area index was calculated by the following formula.

LAI=Leaf area plant-1(cm2) /Lead are covered by plant (cm2)

The root length and shoot length of normal seedlings were measured in centimeters. After oven drying at 80^0 C in hot air oven seedling dry weight (mg/10 seedlings) was recorded.

In case of fertilizer treatments the application of Farm yard manure in combination with recommended dose of NPK appeared to be most suitable treatment for both the varieties which was followed by vermicompost and Rock Phosphate.

Result & Discussion

Table - 1

Effect Of organic manures on the growth of soybean variety PK 416.

Treatments	Germinati on (%)	Field emergence (%)	Root length (cm)	Shoot length (cm) dry	Ten Seedling weight (mg)
T_1	95.35	90.26	20.44	18.86	107.53
T_2	97.42	93.46	21.96	18.93	110.27
T_3	97.12	91.87	21.78	19.71	109.25
T_4	96.47	91.54	21.59	18.99	107.85
T_5	95.24	90.85	19.23	17.85	106.75
T_6	94.75	90.78	20.83	19.11	108.65
T_7	94.36	94.83	19.52	19.85	109.82
T_8	94.89	90.98	20.58	18.83	104.85
Mean	95.70	91.82	20.74	19.02	108.12
S.Em±	0.38	0.51	0.33	0.20	0.58
CD at 5%	1.63	2.19	0.54	0.48	2.16

All the growth components (plant height, number of branches, number of leaves and leaf area index), seed yield and yield components (number of pods, seeds per pod, seed yield) differed significantly due to the application of organic manures (**Table -1**). Significantly higher plant height (49.40cm), higher number of branches per plant (6.07) at harvest, higher number of leaves per plant (21.53) were recorded in T_7 treatment (with the application of 40 : 80 : 25kg NPK per ha and 5 t per ha FYM) in case of PK 416.

Table – 2

Effect Of organic manures on the growth of soybean variety Bragg

Treatments	Plant height at harvest (cm)	Number of branches /plant at harvest	Number of leaves /plant at 60 DAS	Number of pods/ plant	No. of seeds/ pod	100 seed weight (g)
T_1	40.27	7.23	20.45	34.47	2.28	10.62
T_2	51.52	7.67	23.35	37.60	2.41	11.45
T_3	48.85	7.15	22.02	36.50	2.35	11.11
T_4	46.55	6.87	21.32	35.80	2.31	12.17
T_5	42.25	6.38	19.35	34.07	2.21	11.46
T_6	47.85	6.95	21.63	35.20	2.31	11.44
T_7	53.25	7.87	23.75	39.67	2.51	12.68
T_8	45.62	7.24	22.17	35.07	2.29	11.55
Mean	47.02	7.17	21.75	36.04	2.33	11.56
S.Em±	1.44	0.15	0.47	0.61	0.03	0.21
CD at 5%	3.80	0.62	1.87	3.27	0.17	0.99

In case of Bragg Variety also the trend was similar but the individual values differ such as height of 53.25 cm, No. of branches 7.87 and No. of leaves per plant 23.75 was recorded in T_7 treatment with the application of 40 : 80 : 25kg NPK per ha and 5 t per ha FYM **.(Table - 2).**

This treatment was followed by T2 (Vermicompost 4 t ha-1+ Rock Phosphate 176 kg ha-1) where these values are 47.20 cm, 5.73, 21.33 respectively in case of PK 416 where as in case of Bragg these values are 51.52 cm,7.67 and23.35 respectively. Significantly lowest plant height (37.20 cm), number of branches per plant (4.80), and number of leaves per plant (17.53)were recorded inT5 (Farm Yard Manure 5 t ha-1+ Green Leaf Manure 2.60 t ha-1+ Rock Phosphate 240 kg ha-1) in case of PK 416.In case of Bragg these values are inT1(Farm Yard Manure 8 t ha-1+ Rock Phosphate 224 kg ha-1) in

height which is 40.27 cm and for other characters such as number of branches per plant and number of leaves at 60 days after sowing. The lowest values are 6.38 and 19.35 as shown in T5 (Farm Yard Manure 5 t ha-1+ Green Leaf Manure 2.60 t ha-1+ Rock Phosphate 240 kg ha-1) as in case of PK 416.It is clear that there is a need for adding organic manures to the soil in conjuction with inorganic fertilizers, which increased the availability of nutrients considerably resulting in positive effect on growth parameters. These results are in agreement with the findings of Babalad (1999) in soybean, who have opined that there is a need of organics application along with inorganic fertilizers.

The application of RDF + FYM in T7 (Recommended Dose of Fertilizer 40 : 80 : 25 kg NPK $^{ha-1}$+ Farm Yard Manure 5 t ha-1)recorded significantly higher number of pods per plant (39.67), number of seeds per pod (2.51), and 100 seed weight (12.68g) in case of Bragg where as such values in case of PK 416 were 41.75,2.61 and 12.11 in the same treatment. These observations were followed by and almost at par with T2 (Vermicompost 4 t ha-1+ Rock Phosphate 176 kg ha-1) where these values are 37.60, 2.41, and 11.45 g, respectively for Bragg and 39.40 and 2.49 for PK 416 in the same treatment but for the last character the value was 10.46 in treatment fifth. Significantly lowest number of pods per plant (34.07) were observed inT5(Farm Yard Manure 5 t ha-1+ Green Leaf Manure 2.60 t ha-1+ Rock Phosphate 240 kg ha-1), number of seeds per pod (2.21) were also in the same treatment but the lowest 100 seed weight was observed in T1 (Farm Yard Manure 8t ha-1+ Rock Phosphate 224 kg ha-1) which was 10.62 in case of Bragg variety. The lowest value of these characters for PK 416 are 36.17 in T1 (Farm Yard Manure 8 t ha-1 + Rock Phosphate 224 kg ha-1) and 2.32 and 10.46 in T5 (with the application of Farm Yard Manure 5 t ha-1+ Green Leaf Manure 2.60 t ha-1+ Rock Phosphate 240 kg ha-1) This might be result of reduced supply of nutrients at the later stages of crop growth which in legumes, usually result in pod shedding before maturity due to lesser supply of photosynthates towards the pod because of drying and senescence of leaves, Similar, results were obtained in greengram by Raj khowa et al. (2000) who have recorded higher number of seeds per pod, with combined application of FYM and RDF.

The application of RDF + FYM recorded higher yield which might be attributed to rapid mineralization of N from inorganic fertilizers and steady supply of N from FYM, which might have met the N requirement of crop at critical stages. Farm yard manure acts as nutrient reservoir and upon decomposition produces organic acids, thereby absorbed ions are released slowly during entire growth period leading to higher seed yield and yield components.

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