

Original Research Article

Effect of Leaf Nipping and Flower Removal on Growth and Yield of Soybean

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ABSTRACT

A field experiment was undertaken during 2010-11 with an objective to study the effect of leaf nipping, flower removal on growth and yield of soybean, variety MAUS-71 (Samrudhi). The results indicate that the treatment i.e., 100 % leaf nipping + flower removal was recorded lowest seed yield (596.8 kg/ha) followed by the treatment 100% leaf nipping (766.9 kg/ha) with 67.07% and 57.68% yield reduction respectively. Among the treatments 25% flower removal, 50% flower removal was recorded highest seed yield 1788 kg/ha and 1752 kg/ha with minimum respectively which was at par with control treatment (1812 kg/ha). The treatment 25% and 50% leaf nipping and flower removal recorded highest chlorophyll content, oil content and protein content over other treatments except control, which was at par. Among all the treatments 67.07 to 1.36 % yield reduction were observed due to 100 % to 25 % leaf nipping and flower removal treatments in soybean, variety MAUS-71. This yield reduction was only due to reduction in number of leaves per plant, number of flowers per plant, leaf area, leaf area index and chlorophyll content which was responsible for lower down the photosynthesis, other metabolic activities and dry matter accumulation during crop growth and developmental stages. However, it was observed that the treatment 25 % flower removal and 50 % flower removal can be able to recover the yield reduction and was found at par with treatment control (no leaf nipping and flower removal).

Keywords

Soybean, Leaf nipping, Flower removal, Yield

Introduction

Soybean (*Glycine max* (L.) Merrill) is an important source of food, oil, protein belonging to the family *leguminaceae*, sub family *papilionaceae* and genus *Glycine*. Soybean is believed to be South East origin Soybean has become as miracle crop of twentieth century and is often designated as a “Golden bean”. It is triple beneficiary crop unique food, valuable feed and an industrial raw material with considerable potential. Soybean is very important to vegetarians on an account of its richness in protein and oil, carbohydrates, vitamin A (710IU), vitamin

B (300IU), vitamin C, D, E, K, minerals salts viz, Ca, Mg, P and Lecithin in small amount. Environmental condition like biotic and abiotic stresses is responsible for yield losses in soybean. Kogan and Turnipseed (1980) stated that defoliation is the most visible and probably the most common type of soybean injury. Soybean yield losses due to defoliation occur through loss of leaf area and its subsequent effect on plant. Ostlie (1984) described a linear relationship between defoliation and soybean leaf area. Reduced leaf area and reduced light

interception resulting in lower down the photosynthetic activities of plant, Turnipseed (1972) reported that 17 % defoliation at any developmental stages did not reduced yield. Thomas *et al.*, (1978) reported that heavy sequential defoliation begins at beginning of pod through full seed or beginning of maturity significantly reduces, whereas single defoliation never reduced in yield.

Materials and Methods

The experiment was conducted on experimental field of Department of Agricultural Botany, College of Agriculture, Vasandrao Naik Marathwada Krishi Vidyapeeth, Parbhani during *kharif*, 2011.

The soil was medium black with moderate moisture retention capacity. The land having uniform topography was used to study the effect of leaf nipping and flower removal on growth and yield of Soybean. In the present investigation soybean variety MAUS-71 was used. The experiment was laid out in randomized block design with three replication, the treatment were allotted randomly to each replication by keeping the gross plot size was 2.70 m X 5 m and net plot size 1.80 m X 5 m

Treatment details

(Leaf nipping and Flower removal at 40 DAS)

T₁. 100% leaf nipping, T₂. 75% leaf nipping, T₃. 50% leaf nipping, T₄. 25% leaf nipping, T₅. 100% Flower removal, T₆. 75% Flower removal, T₇. 50% Flower removal, T₈. 25% Flower removal, T₉. 100% Leaf nipping + Flower removal, T₁₀. 75% Leaf nipping + Flower removal, T₁₁. 50% Leaf nipping + Flower removal, T₁₂. 25% Leaf nipping + Flower removal, T₁₃. Control

Firstly total number of leaves and flower from five representative plant samples of each plot were counted at full flowering stage. On the basis of data average number of leaves and flowers were calculated from each plot and then as per treatments i.e. 100%, 75%, 50% and 25% leaf nipping, flower removal and leaf nipping + flower removal were done. Each treatment has three replications and in each replication one control plot were kept as untreated. The statistical analysis of the data was carried out by the standard statistical method 'Analysis of variance' (Panse and Sukhatme, 1967).

Results and Discussion

In present investigation leaf nipping and flower removal is the major constraint in high yield of soybean (*Glycine max*). The causes of defoliation are unfavorable natural condition like biotic and abiotic stress. Abiotic stress includes all natural phenomenon like drought or water stress, high rainfall, hail etc. While biotic stress include insect and pest (chewing and biting type) like soybean semilooper, helioverpa sp., spodoptera and girdle beetle, which causes partial to complete defoliation in favorable environmental conditions. The data on yield and yield contributing characters is clarify that the drastic yield reduction occurs with increasing leaf nipping i. e., defoliation (Enyi, 1975). The leaf nipping and flower removal induced yield losses. During 100 %, 75 % 50 % and 25 % leaf nipping levels sufficient to reduce light interception by 18 to 23 % were required to causes yield losses (Dalvi *et al.*, 2011). The present investigation reported that 57.68 %, 52.75 %, 43.0 % and 40.87 % yield reduction were observed in soybean crop due to 100% leaf nipping, 75% leaf nipping, 50% leaf nipping and 25% leaf nipping respectively.

Table.1 Yield and yield contributing characters and biochemical parameters as influenced by various treatments

Treatments	Seed yield (Kg/ha)	Yield reducti on (%)	No. of pods / plant	No. of seed / pod	Test weight (g)	Harvest index (%)	Chlorophyll content	Oil Content (%)	Protein Content (%)
T ₁ (100% leaf nipping)	766.9	57.68	18.67	2.00	11.98	43.10	0.0037	19.78	38.01
T ₂ (75% leaf nipping)	856.2	52.75	27.67	2.00	13.65	49.50	0.0038	20.21	38.41
T ₃ (50% leaf nipping)	1033.0	43.00	52.33	3.20	14.31	53.60	0.0042	20.09	38.50
T ₄ (25% leaf nipping)	1071.6	40.87	76.33	3.67	15.19	59.70	0.0047	20.46	38.74
T ₅ (100% flower removal)	1407.5	22.33	29.33	2.67	12.45	50.43	0.0030	20.10	38.90
T ₆ (75% flower removal)	1526.2	15.78	44.00	2.33	13.02	50.50	0.0033	20.35	39.05
T ₇ (50% flower removal)	1752.4	3.62	51.67	3.00	13.31	51.20	0.0040	20.23	39.10
T ₈ (25% flower removal)	1787.6	1.36	63.33	3.20	13.94	52.03	0.0044	20.35	39.17
T ₉ (100% LN + FR)	596.8	67.07	27.00	2.33	11.18	58.33	0.0042	19.58	39.27
T ₁₀ (75% LN + FR)	861.1	52.48	42.00	3.13	12.72	45.60	0.0047	19.73	39.41
T ₁₁ (50% LN + FR)	1209.4	33.48	62.33	3.00	13.19	58.33	0.0052	20.19	39.54
T ₁₂ (25% LN + FR)	1433.0	20.93	82.67	82.67	14.86	60.10	0.0055	20.51	39.63
T 13 (CONTROL)	1812.2		95.00	95.00	16.42	62.80	0.0055	20.61	39.83
SE	22.89		0.911	0.911	0.69	0.76	0.0014	0.103	0.139
CD at 5%	66.73		2.65	2.65	2.02	2.23	0.0001	0.302	0.407
GM	1178.6		55.79	55.79	13.46	52.54	0.0002	20.170	39.04
CV %	7.37		9.82	9.82	8.93	7.52	0.0046	2.89	3.20

Also 100% flower removal, 75% flower removal, 50% flower removal and 25% flower removal treatments reduced yield kg/ha by 22.33%, 15.78%, 3.62% and 1.36% respectively. The effect of leaf nipping and flower removal treatments on yield of soybean variety MAUS-71 reported that 67.07 %, 52.48 %, 33.48 % and 20.93 % yield reduction were observed in soybean crop due to 100 % LN + FR, 75 % LN + FR, 50 % LN + FR and 25 % LN + FR treatment respectively.

The effect of leaf nipping and flower removal treatment were found significant for yield and yield contributing characters. Among all the treatment, the treatment 100 % leaf nipping + flower removal and 100 % leaf nipping were recorded significantly lowest yield Kg/ha lowest test weight, lowest number of pods per plant, lowest number of seeds per pod and lowest harvest index (%) as compared to other treatments. However the treatment 25 % leaf nipping + flower removal, 25 % leaf nipping and 25 % flower removal and control were recorded highest yield (Kg/ha), test weight (gm), number of seed per pod and harvest index (%) with less yield reduction as compared to other treatment. (Dalvi *et al.*, 2011). In terms of percent yield reduction, the treatment 100 % leaf nipping + flower removal, and 100 % leaf nipping were recorded highest yield reduction that was 67.07 % to 57.68 % over control treatment. However the treatments 25 % flower removal and 50% flower removal were recorded lowest yield reduction i.e., 1.36 % to 3.62 % as compare to control treatment. (Dalvi *et al.*, 2011). From this result, it was observed that 67.07 % to 1.36 % yield reduction were observed due to 100 % to 25 % leaf nipping and flower removal treatments in soybean crop, variety MAUS-71. This yield reduction was only due to reduction in number of leaves per plant, leaf

area and leaf area index which was responsible for lower down the photosynthesis, dry matter accumulation, biomass, growth parameters and other metabolic activity during different crop growth stages i.e., 40 DAS, 60 DAS, 80 DAS and at harvest.

In case of oil content present in soybean seed, various treatments of leaf nipping and flower removal were showed significant differences. In case of leaf nipping and flower removal treatments, it showed that as intensity of leaf nipping and flower removal increases, the oil content in seed get decreases. The treatments control, 25 % and 50% leaf nipping + flower removal were showed highest oil content as compare to rest of the treatments. Whereas the treatment 100 % leaf nipping and 100 % leaf nipping + flower removal showed lowest oil content than other treatments. Similar results were reported by Burton *et al.*, (1995) and by Proulx and Naeve (2009).

The protein content in seed was found significant for leaf nipping and flower removal treatments. In case of leaf nipping and flower removal treatments, it showed that as intensity of leaf nipping and flower removal increases, the protein content in seed get decreases. The treatments control, 25 % and 50% leaf nipping + flower removal were showed highest protein content in soybean seed variety MAUS-71 as compared to other treatments. Whereas treatments 100 % leaf nipping and 100 % leaf nipping + flower removal showed lowest protein content in soybean seed. Similar quest is lined with Burton *et al.*, (1995).

Soybean is a major cash crop of India but farmers are facing problems of biotic and abiotic stresses in soybean cultivation. The defoliation and moisture stress during

flowering and pod filling stage are responsible for yield reduction in soybean because defoliators and moisture stress are responsible for defoliation and flower drop in soybean crop. The present investigation indicated that the 25% to 50% flower drop and defoliation recorded 1.36% to 30% yield reduction as compare to control. Up to 50% flower drop and defoliation are able to recover yield losses under favourable moisture condition during pod development stage in soybean variety MAUS-71.

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