Journal of Pharmacognosy and Phytochemistry

Available online at www.phytojournal.com

E-ISSN: 2278-4136
P-ISSN: 2349-8234
JPP 2019; 8(1): 2649-2652
Received: 08-01-2019
Accepted: 09-02-2019

Samudre Swateja Shivaji
M.Sc. Scholar, Department of Agronomy, College of Agriculture, Latur, Maharashtra, India

Chavan Komal Ankush
M.Sc. Scholar, Department of Agronomy, College of Agriculture, Latur, Maharashtra, India

Patil Aniket Ambadasrao
M.Sc. Scholar, Department of Agronomy, College of Agriculture, Parbhani, Maharashtra, India

KT Jadhav
Associate Professor, Department of Agronomy, College of Agriculture, Latur, Maharashtra, India

Corresponding Author:
Samudre Swateja Shivaji
M.Sc. Scholar, Department of Agronomy, College of Agriculture, Latur, Maharashtra, India

Influence of different weed management practices on growth of soybean (*Glycine max*. (L.) Merrill)

Samudre SS, Chavan KA, Patil AA and Jadhav KT

Abstract

A field experiment was carried out at experimental farm of Agronomy section, College of Agriculture, Latur during *Kharif* 2017. As the title indicates, the current work aims to study the effect of integrated weed management on growth attributes of soybean (*Glycine max*. (L.) Merrill). The experiment was laid out in a Randomized Block Design with eight treatments and replicated thrice.

The work revealed that, the treatment (T_8) recorded maximum values in case of important growth attributes *viz*., plant height (46.71 cm) at harvest, mean number of branches plant^{-1} (7.00 cm) at harvest, mean number of nodules plant^{-1} at 60 DAS (56.33), which was found at par with treatment (T_4) Pendimethalin 30% EC @ 1kg a.i./ha (PE) + Imazethapyr 10% SL @ 100g a.i./ha (PoE), (T_1) Pendimethalin 30% EC @ 1 kg a. i./ha (P. E.) + Hoeing at 25-30 DAS and (T_3) Imazethapyr 10% SL @ 100 g a.i./ha (PoE). The treatment (T_8) recorded maximum values in case of leaf area plant^{-1} at 60 DAS (9.65 dm^2), dry matter accumulation plant^{-1} (17.57 g) at harvest, mean number of pods plant^{-1}(42.30) at harvest which was followed by treatment (T_4) Pendimethalin 30% EC @ 1kg a.i./ha (PE) + Imazethapyr 10% SL @ 100g a.i./ha (PoE). Lowest values of above mentioned parameters were recorded with treatment (T_7) i.e. Weedy check as compared to all other treatments.

Study revealed the superiority of treatment weed free (T_8) for all of important growth attributes and suggesting the positive benefits of weed management on growth which indirectly influences the yield of soybean.

Keywords: Weed management, weeds, herbicides, soybean, growth, branches, plant height

1. Introduction

Soybean (*Glycine ma*x (L.) Merill) is a leguminous crop and belongs to family leguminoceae with sub family papilionaceae. It is originated in China and it was introduced in India in recent years. Soybean (*Glycine max*) is important oil yielding rainy season crop having multiple uses. Soybean which is also known as soya beans are species of legume that have become one of the most widely consumed foods in the world. They are extremely useful for human health, and they are easy to cultivate as well.

Soybean is an important crop in human and animal nutrition, because it is a major source of edible vegetable oil and high protein feed as well as food in the world. The protein content of soybean ranges from 36 to 56 percent of dry weight (Atli Arnarson 2015) [1].

During *kharif* 2016, all India estimated area, production and productivity of soybean was 109.716 lakh ha, 114.907 lakh MT and 1047 kg ha^{-1} respectively (Anonymous 2016) [2]. Major soybean growing states in India are Madhya Pradesh (58%), Maharashtra (30%), Rajasthan (6%), Karnataka, Uttar Pradesh, Andhra Pradesh, Chhattisgarh and Gujarat. During the year 2017-2018 world's soybean production was 346.919 lakh MT and India 9.500 lakh MT (Anonymous 2017) [3].

Among the major constraints, initial heavy infestation of weeds is one of the important factors, which hinders its overall growth and productivity (Malik and Malik, 1994) [4]. It is an established fact that weeds, due to their competition for water, light and nutrients reduce crop yields, but little is known about the physiological interaction between crop plants and weeds that brings about the reduction in growth which indirectly results in yield reduction (Aspinall and Milthorpe, 1959) [5].

Weed management is one of the most important factors impacting agricultural productivity. Weeds directly compete with crops for limited resources which reduce crop yield and increase the cost of production. Weeds also impede the efficiency of crop harvest and harbour insects and diseases that can be harmful to crops. There are three goals of any weed management system: reduce weed density, reduce the amount of damage that a given density of weeds inflicts on an associated crop, and alter the composition of weed communities towards less aggressive and easier-to-manage species.

Among the various weed management options herbicide use is not only efficient method but it is cost effective also. On the other hand, physical weed control measure *viz.* hand weeding are safe but labour intensive.

Crop growth attributes indirectly influences the yield. Keeping this view the present study was carried out to study the effect of integrated weed management on growth attributes of soybean (*Glycine max*. (L.) Merrill).

2. Materials and Methods

A field experiment was conducted during *kharif* season of 2017-18 at Experimental Farm, Agronomy Section, College of Agriculture, Latur. The experimental site was low in available nitrogen (108.00 kg ha^{-1}), low in available phosphorus (8.18kg ha^{-1}), high in available potassium (430.00 kg ha^{-1}) and alkaline (p^H 7.45) in reaction. The soil was clayey in texture with moderate moisture holding capacity which was good for normal growth. Mechanical analysis of soil was done by International Pipette Method (Piper, 1966) [6], Available nitrogen by alkaline potassium permanganate method (Subbiah and Asija, 1956) [7], available phosphorous by Olsen method (Olsen *et al*., 1954) [8] and available potassium by Flame emission method (Jackson, 1967) [9].

The experiment was laid out in a Randomized Block Design with eight treatments and replicated thrice. The treatments were (T_1) Pendimethalin 30% EC @ 1 kg a. i./ha (P. E.) + Hoeing at 25-30 DAS, (T_2) Quizalofop-ethyl 5% EC @ 0.05 kg a. i./ha (PoE), (T_3) Imazethapyr 10% SL @ 100 g a.i./ha (PoE), (T_4) Pendimethalin 30% EC @ 1 kg a.i./ha (PE) + Imazethapyr10% SL @ 100 g a.i/ha (PoE), (T_5) Pendimethalin 30% EC @ 1 kg a. i. /ha (PE) + Quizalofop-ethyl 5% EC @ 0.05 kg a.i/ha.(PoE), (T_6) Haloxyfop – ethoxyethyl 10.8 EC @ 0.05 kg a.i./ha.(PoE), (T_7) Weedy check and (T_8) Weed free check.

Gross and net sizes of plots were 5.4 m × 3.9m and 4.5m × 2.9 m respectively. Sowing was done by dibbling method on 28 June 2017 with spacing 45cm × 05 cm. Fertilizers were applied to respective plots as per the recommended dose of fertilizer i.e. 30:60:30 NPK kg ha^{-1} by using the urea (46% N), 10:26:26 and murate of potash (60% K2O). The recommended cultural practices and plant protection measures were taken. The crop was harvested on 11 Oct. 2017.

Growth attributes were worked out as follows,

2.1 Plant height (cm)

The plant height was measured in cm from the base of plant up to base of top most fully opened leaf.

2.2 Leaf area plant^{-1} (dm^2)

Leaf area was calculated by using the plant samples taken for the dry matter studies from each net plot. The leaves were arranged into leaflets and grouped into three group's *viz.*, small, medium and large. The maximum length and breadth of five leaflets from each group was measured and the mean area per plant worked out by following formula and converted into dm^2.

$$A = \sum n=3 \; L \times B \times K \times N$$

Where

A: Leaf area in dm^2 under particular group.

L: Length of leaflet in cm

B: Maximum breadth of leaflet in cm.

K: Leaf area constant for soybean K = 0.6889

N: Number of leaflets under a particular group

∑: Summation

3: Number of groups of leaflet

2.3 Number of branches plant^{-1}

Number of branches born on main shoot of a plant were counted.

2.4 Dry matter accumulation plant^{-1} (g)

The weight of dry matter is an index of productive capacity of the plant. Hence, one representative plant from gross plot was randomly uprooted at harvest. The roots of plant uprooted for dry matter study from each gross plot were removed. This separated plant was sun dried in the first instance and oven dried at 65 + 2°C temperature till constant weight obtained. The constant weight was recorded as total dry matter weight plant^{-1} (g) for each treatment.

2.5 Number of nodules plant^{-1}

One plant selected for dry matter accumulation from each net plot were uprooted and cleaned. Number of nodules arises on uprooted plant roots were counted.

2.6 Number of pods plant^{-1}

The number of pods plant^{-1} were counted and recorded periodically on plant basis.

2.7 Statistical analysis and interpretation of data

Data obtained on various variables were analyzed by "analysis of variance method" (Panse and Sukhatme, 1967) [10]. The total variance (S^2) and d. f. (n-1) divided into different possible sources. The variance due to replication and treatment effects were calculated and compared with error variance for finding out "F" values and ultimately for testing the significance at P = 0.05 wherever the results were found significant. Critical difference was calculated for comparison of treatment mean at 5% level of significance where results are significant.

The total precipitation received during crop period was only 626 mm with 27 rainy days.

3. Results and Discussion

Almost all the growth attributing characters *viz*., plant height(cm), leaf area plant^{-1}, mean number of branches plant^{-1}, dry matter accumulation plant^{-1} (g), mean number of nodules plant^{-1} and mean number of pods plant^{-1} were significantly influenced by various treatments during active growth and maturity.

3.1 Plant height (cm)

Plant height and its rate of increase were found to be significant amongst different treatments (Table 1). The weed free plot (T_8) recorded highest plant height at harvest which was found at par with treatment (T_4) Pendimethalin 30% EC @ 1kg a.i./ha (PE) + Imazethapyr 10% SL @ 100g a.i./ha (PoE), treatment (T_1) Pendimethalin 30% EC @ 1 kg a. i./ha (P. E.) + Hoeing at 25-30 DAS and (T_3) Imazethapyr 10% SL @ 100 g a.i./ha (PoE). Treatment weedy check (T_7) recorded shorter plants at harvest as compared to all other treatments. It might be due to no competition for resources between crop plants and weeds due to effective weed control. Similar results were reported by Kewat *et al.* (2001) [11].

3.2 Leaf area plant^{-1} (dm^2)

Leaf area plant^{-1} was higher in weed free plot (T_8) over all other treatments at 60 DAS and which was followed by the treatment (T_4) Pendimethalin 30% EC @ 1kg a.i./ha (PE) + Imazethapyr 10% SL @ 100g a.i./ha (PoE) and significantly superior over the treatment (T_7) weedy check. It might be due to no competition for resources between crop plants and weeds due to effective weed control. The results are in close conformity with Amaregouda *et al*. (2006) [12].

3.3 Mean number of branches plant^{-1}

In respect of mean number of branches plant^{-1} weed free plot (T_8) produced maximum number of branches at harvest which was found at par with treatment (T_4) Pendimethalin 30% EC @ 1kg a.i./ha (PE) + Imazethapyr 10% SL @ 100g a.i./ha (PoE), (T_1) Pendimethalin 30% EC @ 1 kg a. i./ha (P. E.) + Hoeing at 25-30 DAS and (T_3) Imazethapyr 10% SL @ 100 g a.i./ha (PoE) and significantly superior over rest of the treatments. It might be due to no competition for resources between crop plants and weeds due to effective weed control. The results are in close conformity with Raghuwanshi *et al*. (2005) [13].

3.4 Dry matter accumulation plant^{-1} (g)

Increase in mean total dry matter production was the cumulative effect of increase in various growth characters like plant height, number of branches, number of functional leaves, leaf area, number of pods plant^{-1}. Increase in mean dry matter accumulation plant^{-1} was affected by different weed control treatments (Table 01). Treatment (T_8) recorded maximum mean dry matter at harvest and which was found at par with treatment (T_4) Pendimethalin 30% EC @ 1kg a.i./ha (PE) + Imazethapyr 10% SL @ 100g a.i./ha (PoE) and significantly superior over rest of the treatments. Treatment weedy check recorded lowest mean dry matter accumulation at harvest. It might be due to effective control of weeds, which indirectly helped the plant to grow with its full yield potential. Similar results were reported by Raghuwanshi *et al*. (2005) [13] and Shete *et al*. (2007) [14].

3.5 Number of nodules plant^{-1}

At 60 DAS weed free plot T_8 recorded highest mean number of nodules plant^{-1} which was found at par with treatment (T_4) Pendimethalin 30% EC @ 1kg a.i./ha (PE) + Imazethapyr 10% SL @ 100g a.i./ha (PoE), (T_1) Pendimethalin 30% EC @ 1 kg a. i./ha (P. E.) + Hoeing at 25-30 DAS and (T_3) Imazethapyr 10% SL @ 100 g a.i./ha (PoE) and found significantly superior over rest of treatments. In general weed free plot recorded highest number of nodules plant^{-1} and weedy check recorded lowest number of nodules plant^{-1} at 60 DAS. It might be due to effective control of weeds. Similar results were reported by Billore *et al.* (1999) [15].

3.6 Mean number of pods plant^{-1}

Mean number of pods plant^{-1} were significantly affected by different treatments. At harvest weed free plot (T_8) recorded highest mean number of pods plant^{-1} and significantly superior over rest of the treatments. Treatment (T_7) weedy check recorded lowest pod plant^{-1} at harvest. This might be happened due to effective weed control, which reduced the crop-weed competition for resources. Similar result reported by Kulal *et al*. (2016) [16].

Table 1: Growth attributes of soybean as influenced by different treatments.

Treatments	Plant height (cm) (at harvest)	Leaf area plant^{-1} (dm^2) (at 60 DAS)	Mean number of branches plant^{-1} (at harvest)	Dry matter accumulation plant^{-1} (g) (at harvest)	Mean number of nodules plant^{-1}(at 60 DAS)	Mean number of pods plant^{-1} (at harvest)
T1 - Pendimethalin 30% EC @ 1 kg a. i./ha (P. E.) + Hoeing at 25-30 DAS	44.05	9.22	6.53	12.83	52.33	27.44
T2 - Quizalofop-ethyl 5% EC @ 0.05 kg a. i./ha (PoE)	40.83	9.045	6.20	12.33	48.67	26.39
T3 – Imazethapyr 10% SL @ 100 g a.i./ha (PoE)	42.33	9.17	6.37	12.67	50.00	26.72
T4 - Pendimethalin 30% EC @ 1 kg a.i./ha (PE) + Imazethapyr10% SL @ 100 g a.i/ha (PoE)	44.38	9.29	6.80	16.33	53.00	34.14
T5 – Pendimethalin 30% EC @ 1 kg a. i. /ha (PE) + Quizalofop-ethyl 5% EC @ 0.05 kg a.i/ha.(PoE)	36.67	9.01	6.07	12.40	47.33	25.41
T6– Haloxyfop – ethoxyethyl 10.8 EC @ 0.05 kg a.i./ha.(PoE)	34.00	8.86	5.73	11.70	46.33	23.42
T7 - Weedy check	33.34	7.79	5.67	10.86	39.33	21.46
T8 - Weed free check.	46.71	9.65	7.00	17.57	56.33	42.30
S.E.±	1.92	0.28	0.25	0.62	2.33	1.6
CD at 5%	5.8	0.87	0.77	1.87	7.06	5.0
General Mean	40.29	9.00	6.30	13.33	49.17	28.41

4. Conclusion

On the basis of above findings it may be inferred that for achieving maximum basic productive growth attributes *viz*., plant height(cm), leaf area plant^{-1} (dm^2), mean number of branches plant^{-1}, dry matter accumulation plant^{-1} (g), mean number of nodules plant^{-1} and mean number of pods plant^{-1} which influences yield of soybean, the treatment weed free (T_8) was found effective.

5. References

1. Atli Arnarson. Soybean 101: Nutritional facts and health effects, 2015.
2. Anonymous, 2016. Soybean Processors Association of India.w.w.w.sopa.org.
3. Anonymous. Soybean Processors Association of India, 2017. w.w.w.sopa.org.
4. Malik RK, Malik YS. Development of herbicide resistance in India. In: Appropriate weed control in South East Asia, 1994.
5. Aspinall D, Milthorpe FL. An analysis of competition between barley and white persicaria. I. The effect on growth. Ann. appl. Biol. 1959; 47(1):156-172.
6. Piper CS. Soil and plant analysis. Hans Pub., Bombay, 1966, 19-136.
7. Subbaih BV, Asija GL. Rapid procedure for the estimation of available nitrogen in soil. Current Sci. 1956; 125:259-260.

8. Olsen SR, Cole GV, Watenable FS, Dean LA. Estimation of available phosphorus in soil by extraction with sodium bicarbonate. U.S.D.A. Cir, 1954, 939(19).
9. Jackson ML. Soil chemical analysis. Prentice-Hall of India Private Ltd., New Delhi-110 001, 1967.
10. Panse VG, Sukhatme PV. Statistical Methods for Agricultural Workers (1st edn.), ICAR, New Delhi, 1967.
11. Kewat ML, Pandey J. Effect of pre-emergence application of herbicides on weed control in soybean. Indian J Agron. 2001; 46(2):327-331.
12. Amaregouda A, Jitendra Jadhav, Chetti MB, Nawalagatti. Journal of Agriculture and Allied Sciences. 2013; 2(4):2319-9857.
13. Raghuwanshi OPS, Deshmukh SC, Raghuwanshi SRS. Effect of some new post-emergence herbicides on weed parameters and grain yield of soybean. Reason Crops. 2005; 6(3):448-451.
14. Shete BT, Patil HM, Kolekar PT. Effect of cultural practices and post emergence herbicides against weed control in soybean. Indian J Agric. Sci. 2007; 3(2):273-275.
15. Billore SD, Joshi OP, Ramesh A. Herbicidal effects on nodulation, yield and weed control in soybean (*Glycine max*). Indian Journal of Agricultural Science. 1999; 69(5):329-331.
16. Kulal DA, Dhaigude GS, Adat SS. International journal of Agricultural Sciences. 2016; 12(2):219-222.