Journal of Pharmacognosy and Phytochemistry

Available online at www.phytojournal.com

E-ISSN: 2278-4136
P-ISSN: 2349-8234
JPP 2018; SP1: 3306-3309

CH Bharat Bhushan Rao
Department of Agronomy, College of Agriculture Professor Jayashankar Telangana State Agricultural University, Rajendranagar, Hyderabad, Telangana, India

Correspondence
CH Bharat Bhushan Rao
Department of Agronomy, College of Agriculture Professor Jayashankar Telangana State Agricultural University, Rajendranagar, Hyderabad, Telangana, India

Influence of integrated weed management practices and biofertilizers on yield attributes and yield of *Kharif* soybean [*Glycine max* (L.) Merill] in southern Telangana agro- climatic zone

CH Bharat Bhushan Rao

Abstract
The experiment was conducted under field conditions at Agricultural College farm, Rajendranagar. Hyderabad, Telangana State during 2014–2015 and 2015–2016, to assess the effect of Bio-fertilizers and Integrated Weed Management (IWM) Practices on yield of soybean. The experiment was laid out in split-plot design with three replications. The main treatments were Five Integrated Weed Management (IWM) practices and the sub plot treatments were four Integrated Nutrient Management (INM) practices. Days to 50% flowering were not influenced by different treatments. At harvest the number of pods plant^{-1} (33.32), number of seeds pod^{-1} (3.0, 3.1),test weight (g) (12.5,12.8), seed yield (17.21,17.35qha^{-1}), haulm yield (25.18,25.34 qha^{-1}) were recorded significantly highest in treatment W_4 (Hand weeding at 25 and 45 DAS) in two years respectively which was on par with W1 (pendimethalin @ 1.0 kg *a.i* ha^{-1} as pre-emergence followed by hand weeding at 25 DAS) The yield of grain and haulms were not altered by the application of bio- fertilizers or their interaction with weed management treatments. Hence application of pendimethalin @ 1.0 kg *a.i* ha^{-1} as pre-emergence followed by one hand weeding at 25DAS can be recommended to realize higher yields in Southern Telangana Agro-climatic Zone.

Keywords: Integrated Weed Management Practices, Bio-Fertilizers, Yield attributes and Yield

Introduction
Soybean (Glycine max L.) is one of the most important oilseed crops globally (Chaudhary *et al*., 2014) [2]. Soybean [*Glycine max* (L.) Merill] is a miracle golden bean of the 20th century. It occupies third place among oilseed crops of Telangana State. It is referred as wonder crop as it contains 40% good quality protein and 20% oil high in essential unsaturated fatty acids (Layek *et al*., 2014) [4]. In Telangana state, it is grown on 2.46 lakh hectares with production of 2.63 lakh tons and productivity of 1070 kg ha^{-1}. It is widely adopted in various cropping systems. Soybean is becoming popular in Southern Climatic Zone of Telangana. Inherent low levels of soil fertility status, population of crop beneficial microbes including rhizobium, phosporus solubilising bacteria and potassium solubilising bacteria resource scarce situations are now recognized among the basic causes of low productivity. Improvements in biological nitrogen fixation can help to enhance soybean productivity per unit area. Weeds are a permanent constraint to crop productivity in agriculture. They are plants, which compete for nutrients, space, light, moisture and exert a lot of harmful effects by reducing the quality as well as quantity of the crop if the weed populations are left uncontrolled (Singh and Sheoran, 2008) [8]. Appropriate weed management practice is one of the most important components of improved production technology for obtaining higher crop yield with maximum benefit (Anwar *et al*., 2004) [1]. In India, hand weeding is widely used for weed management and hoeing can be effective on older weeds, and remains selective, many mechanical control methods become difficult after the cotyledon stage and their selectivity decreases with increasing crop and weed age (Verma *et al*., 2015) [10]. It is a laborious, time consuming and expensive method. Use of suitable herbicide provides more effective and efficient weed control. The crop is highly sensitive to early weed infestation during the seedling stage and the critical crop-weed competition during 3-4 weeks after sowing (Jha *et al*., 2014) [3]. Hand weeding and blade harrow are traditionally practiced to wardoff the weeds, loosen the soil for good aeration and conserve the moisture. The herbicides are apprehended to have direct or indirect consequences on non-targeted organisms including soil micro flora in the field. Hence, the present investigation was undertaken to study the bio-efficacy of herbicide combinations and bio-fertilizer management. on the growth, yield and yield attributes of soybean.

Material and Methods

A field study was conducted at Agricultural College Farm, Rajendranagar, Hyderabad, Telangana state during cropping season of 2014 and 2015.The soil was sandy loam in texture having 7.8 pH and EC 0.21 d S m^{-1}. It was very poor in nutrient status with 0.35% OC and 226 kg ha^{-1} available N, available P was 18 kg $ha^{-1}$and available K was 236 kg ha^{-1}. The layout was a split plot design. The main treatments were : (W1) Pre-emergence application of pendimethalin @ 1.0 kg a.i ha^{-1} followed by hand weeding 25 DAS, (W2) Pre emergence application of pendimethalin @1.0 kg a.i ha^{-1} followed by post-emergence application of imazethapyr @ 100 g a.i ha^{-1}+ quizalofop-p-ethyl @ 50 g a.i ha^{-1} 25DAS, (W3) Pre–emergence application of pendimethalin @1.0 kg a.i ha^{-1} followed by post-emergence application of odyssey i.e. imazethapyr + imazamox@ 70 g a.i ha^{-1} at 25 DAS, (W4) Hand weeding at 25 and 45 DAS and (W5) un-weeded check. The sub plot treatments comprising of (F1) Recommended dose of fertilizers @ 30:60:40 kg ha^{-1} NPK, (F2) RDF+ seed treatment with rhizobium @ 250g $10kg^{-1}$seed, (F3) RDF+seed treatment with rhizobium @ 250g $10kg^{-1}$ seed + phosphate solubilizing bacteria @ 5 kg ha^{-1}, (F4) RDF + seed treatment with rhizobium @ 250 g10 kg^{-1} seed + phosphate solubilising bacteria @ 5 kg ha^{-1} + potassium solubilising bacteria@ 5kg ha^{-1}. Recommended fertilizer dose of 30:60:40 kg ha^{-1} NPK was calculated for the dimensions of each sub plot and applied at the time of sowing in the form of urea. Single super phosphate and muriate of potash. Seed rate was @ 63 kg ha^{-1}. The bio-fertilizers *brady rhizobium japonica* were mixed as per the treatment in jaggery solution prepared @ 250 g for 10 kg seed. The seed was thoroughly mixed with the solution and shade dried. The Phosporos solubilising bacteria and potassium solubilising bacteria were applied @ 5 kg ha^{-1} after mixing with FYM. The seeds were dibbled at the rate of two per hill 10 cm apart in 30cm interval. The crop was sown on 10th July in 2014 and 18th June in 2015.A pre emergence herbicide (Pendimethalin 30%EC) was applied on next day of sowing and post emergence application of (imazethapyr 10% SL,Quizalofop-p-ethyl 5%EC and odyssey) was done 25 DAS with the help of knapsack sprayer fitted with flat fan nozzle. Pods were harvested from net plot. The growth, yield parameters and yield of soybean were recorded from five randomly selected plants in each plot. Economics was calculated taking into consideration prevailing market prices of inputs output. The experimental data was subjected to statistical test by following analysis of variance technique suggested by Panse and Sukhatme (1978) [6].

Results and Discussions

crop growth, yield and yield components

The data on days to 50 per cent flowering, number of pods/plant, seeds/pod and test weight influenced by weed management treatments and microbial inoculants is presented in table 1. The results showed that 50 per cent of the plants flowered in 30.1 to 34.1 days due to different weed management practices during 2014 and 29.4 to 34.1 days during 2015. There were no significant differences in this trait due to any of the weed management treatments. The competition by freely growing weeds reduced the number of pods/plant. Maximum of 33 and 32 pods/plant were recorded by weeding at 25 and 45 days during 2014 and 2015. There were 16 pods/plant in the un-weeded check in both the years. This accounted for a reduction of 52 per cent and 50 per cent in the respective years. Similar finding were also reported elsewhere by Ram *et al.* (2013) [7]. Such a huge reduction to about half the number of pods/plant in the un-weeded crop compared to hand weeding at 20 and 40 days. The weed management treatments also influenced the number of seeds/pod. Each pod had 3.0 seeds during 2014 and 3.1 seeds during 2015 due to hand weeding at 25 and 45 DAS. They reduced to 2.2 and 2.3 in the un-weeded check during the corresponding years. Such a grand loss could probably be due to less number of flowers and impaired fertility in the overcrowded crop by the diverse vegetation of weed flora. The pre-emergence application of pendimethalin and hand weeding 25 DAS or the post emergence application of herbicides did not reduce the number of seeds/pod significantly compared to hand weeding at 25 and 45 DAS both during 2014 and 2015. These observations are also in agreement with that of Meena *et al*. (2011) [5] recorded significantly less number of pods/plant and seeds/pod in response to the application of imazethapyr @ 50, 100 or 150 g *a.i* ha^{-1}. The microbial inoculants did not bring additional advantage over the application of recommended dose of 30:60:40 kg $ha^{-1}N:P_2O_5:K_2O$ in days to 50 per cent flowering, number of pods per plant and number of seeds/pod in either of the two years. The test weight was 11.5 g during 2014 and 11.6 g during 2015 due to the pre-emergence application of pendimethalin @1.0 kg *a.i* ha^{-1} and hand weeding at 25 DAS. This was on par with hand weeding twice at 25 and 45 DAS. Jha *et al*. (2014) [3] also reported that the test weight of soybean seed was on par by the post emergence application of imzethapyr @ 100 g *a.i* ha^{-1} but significantly reduced in response to the post emergence application of clodinafop propargyl @ 80, 100 or 180 g *a.i* ha^{-1}Soybean recorded maximum seed yield of 1721 kg ha^{-1} during 2014 and 1735 kg ha^{-1} during 2015 by weeding at 25 and 45 DAS. The mean yield was 1729 kg

ha^{-1}.The seed loss was severe in the un-weeded check. The crop produced 827 kg ha^{-1}seed and during 2014 and 840 kg ha^{-1} during 2015.The mean yield was 834 kg ha^{-1}.The average loss was 52 per cent. Maximum haulm yield of 2518 and 2534 kg ha^{-1} was also obtained due to hand weeding in the corresponding years. The unchecked weeds reduced the haulm yield to about half in the weeded crop. The result eulogies the need for a crop weed free condition during the critical 4-6 weeks after sowing to harness the yield potential of soybean. Sangeetha *et al*. (2014) [9] from her research observed that the seed and haulm yield increased significantly due to the post emergence application of imazythapyr @ 200 g *a.i* ha^{-1} followed by earthing up on 45 days compared to hand weeding on 25 and 45 days. But hand weeding at 35 days following the application of this herbicide enabled the crop to produce on par with hand weeding at 20 and 35 DAS. The results are analogous to those reported by Ram *et al.* (2013) [7]

Table 1: Days to 50% flowering and yield components as influenced by weed management treatments and bio-fertilizers during 2014 and 2015

Treatment	Days to 50% flowering		Number of pods plant^{-1}		Number of seeds/pod		Test weight (g)	
	2014	2015	2014	2015	2014	2015	2014	2015
Weed management								
W1:PE Pendimethalin @ 1kg *a.i* ha^{-1}fb Hand weeding at 25 DAS	34.1	34.1	27	29	2.9	3.0	11.5	11.6
W2:PE Pendimethalin @ 1kg *a.i* ha^{-1}fb PoE Imazethapyr @100 g *a.i* ha^{-1}+Quizalofop- P-ethyl @ 50 g *a.i* ha^{-1} 25DAS	30.1	29.4	22	22	2.7	2.7	9.4	9.5
W3:PE Pendimethalin @ 1kg *a.i* ha^{-1}fb PoE Imazethapyr + Imazamox@ 70 g *a.i* ha^{-1} 25 DAS	32.2	32.5	24	25	2.8	2.8	9.8	9.8
W4:Hand weeding at 25 and 45 DAS	31.5	31.8	33	32	3.0	3.1	12.5	12.8
W5:Unweeded check	32.4	32.7	16	16	2.2	2.3	10.4	10.6
SE±	1.3	1.4	2	3	0.1	0.1	0.7	0.8
CD(P=0.05)	NS	NS	6	6	0.2	0.3	1.7	1.9
Bio-fertilizers								
F1: Fertilizers @ 30:60:40 kg ha^{-1} N:P_2O_5:K_2O	30.6	30.4	23	23	2.6	2.7	10.3	10.6
F2: F1 + Rhizobium @ 250 g10 kg^{-1} seed	31.9	31.9	24	25	2.7	2.8	11.0	11.2
F3: F2 + Phosphate solubilising bacteria@ 5 kg ha^{-1}	32.1	32.2	24	25	2.8	2.8	10.7	10.5
F4: F3+ Potassium solubilising bacteria @5 kg ha^{-1}	33.7	34.0	25	26	2.8	2.9	10.9	11.1
SE±	1.6	1.5	3	3	0.09	0.8	0.5	0.4
CD(P=0.05)	NS	NS	NS	NS	NS	NS	NS	NS
Weed Management x Bio-fertilizers								
SE±	3.5	3.4	8	7	0.2	0.2	1.1	1.0
CD(P=0.05)	NS	NS	NS	NS	NS	NS	NS	NS

Table 2: Grain and haulm yield of soybean as influenced by weed management treatments and bio-fertilizers

Treatment	Seed yield (kg ha^{-1})			Haulm yield (kg ha^{-1})		
	2014	2015	**Pool**	2014	2015	**Pool**
Weed management						
W1:PE Pendimethalin @ 1kg *a.i* ha^{-1}fb Hand weeding at 25DAS	1,641	1,653	1647	2,442	2,459	2450
W2:PE Pendimethalin @ 1kg *a.i* ha^{-1}fb PoE Imazethapyr @100g *a.i* ha^{-1}+Quizalofop- P-ethyl @ 50g *a.i* ha^{-1}25DAS	1,404	1,440	1422	2,200	2,219	2209
W3:PE Pendimethalin @ 1kg *a.i* ha^{-1}fb PoE Imazethapyr + Imazamox@ 70 g *a.i* ha^{-1}25 DAS	1,412	1,439	1426	2,255	2,273	2264
W4:Hand weeding at 25 and 45 DAS	1,721	1,735	1729	2,518	2,534	2526
W5:Unweeded check	827	840	834	1,280	1,287	1283
SE±	93	75	65	48	51	38
CD(P=0.05)	217	175	185	114	120	145
Bio-fertilizers						
F1:Fertilizers @ 30:60:40 kg ha^{-1} N:P_2O_5:K_2O	1,340	1,360	1339	2,064	2,087	2076
F2:F1 + Rhizobium @ 250g10 kg^{-1} seed	1,383	1,395	1387	2,111	2,120	2116
F3:F2 + Phosphate solubilising bacteria@ 5kg ha^{-1}	1,430	1,450	1433	2,168	2,182	2175
F4:F3+ Potassium solubilising bacteria @ 5 kg ha^{-1}	1,451	1,480	1464	2,213	2,228	2221
Mean	1,401	1,421	-	2,139	2,154	-
SE±	72	54	66	55	52	53
CD(P=0.05)	NS	NS	NS	NS	NS	NS
Weed management x Bio-fertilizers						
SE±	161	122	84	123	117	75
CD(P=0.05)	NS	NS	NS	NS	NS	NS
Year						
SE±			45			41
CD(P=0.05)			NS			NS
Weed management x year						
SE±			64			58
CD(P=0.05)			NS			NS
Bio-fertilizers x year						
SE±			101			97
CD(P=0.05)			NS			NS
Weed management x Bio-fertilizers x year						
SE±			11			10
CD(P=0.05)			NS			NS

Reference

1. Anwar S, Shah WA, Bakht J, Jabeen U. Comparision of sorghum extracts, chemical and hand weeding management in wheat crop. Journal of Agronomy. 2004; 3(1):59-67.
2. Choudhary P, Jhajharia A, Kumar R. Influence of sulphur and zinc fertilization on yield, yield components and quality traits of soybean *(glycine max L.)*.The Bioscan. 2014; 9(1):137-142.
3. Jha BK, Chandra R, Rohitashav Singh. *Influence of* post

emergence herbicides on weeds, nodulation and yields of soybean and soil properties. Legume Research 2014; 37(1):47-54.
4. Layek J, Shivakumar BG, Rana DS, Gangaiah B, Lakshman K, Paramanik B. Growth, nodulation, physiological indices and yield of soybean as influenced by sulphur and boron nutrition. The Bioscan. 2014; 9(4):1389-1393.
5. Meena DS, Baldev Ram, Chaman Jadon, Tetarwal JP. Efficacy of imazethapyr on weed management in soybean. Indian Journal of Weed Science. 2011; 43(3, 4):169-171.
6. Panse VG, Sukhatme PV. Statistical methods of Agricultural workers, ICAR, New Delhi, 1978
7. Ram Hari, Guriqbal Singh, Navneet Aggarwal, Buttar GS, Onkar Singh. Standardization of rate and time of application of imazethapyr weedicide in soybean. Indian Journal Plant Production. 2013; 41(1):33-37.
8. Singh S, Sheoran P. Studies of IWM practices in rainfed maize under submontaneous conditions. Indian Journal of Dry land Agricultural research and Development. 2008; 23:6-9.
9. Sangeetha C, Chinnusamy C, Prabhakaran NK. Efficiency of early post emergence herbicide and integrated weed management methods in soybean (Glycine max) and their residual effect on succeeding crops. International journal of tropical Agriculture. 2014, 265-274.
10. Verma SK, Singh SB, Meena RN, Prasad SK, Meena RS, Gaurav. A review of weed management in India: The need of new directions for sustainable agriculture. The Bioscan. 2015; 10(1):253-263.