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Weed flora in soybean (*Glycine max* L. Merrill) Influenced by weather parameter and weed management practices

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Abstract

An experiment on weed management in soybean (*Glycine max* L. Merrill) under varied weather conditions was carried out during the *Kharif* season of 2021-22 at experimental farm, Department of Agronomy, College of Agriculture, Vasant Rao Naik Marathwada Krishi Vidyapeeth, Parbhani (M.S). The experiment was laid out in Split Plot Design with three replications and twelve treatments combination of main plot treatments consisted of three dates of sowing D₁(26MW), D₂ (28MW), D₃ (30MW) and subplot treatments consisted of four weed management practices viz. W₁: PE Diclosulum 84% WDG@22-26g ai ha⁻¹ +1 Hoeing, W₂: PoE Sodium aceflurofen 16.5% + Clodinafop propargly 8% @ 80+165g ai ha⁻¹ W₃: 1Hand Weeding +1 Hoeing and Weedy Check (W₄).

The results shown that delayed sowing resulted in reduced yields as well as density of weeds was also lowered at later stages in delayed sowing. Among the treatments of weed management in Soybean, the treatment on W₃: 1Hand Weeding +1 Hoeing followed by treatment W₂: PoE Sodium aceflurofen 16.5% + Clodinafop propargly 8% @ 80+165g ai ha⁻¹ were found most effective in control of weeds, recorded higher weed control efficiency. The maximum grain yield, straw yield, biological yield observed in treatment weed free followed by PoE Sodium aceflurofen 16.5% + Clodinafop propargly 80% + 165g ai./h followed by W₁ (PE Diclosulum 84% WDG@ 22-26g a.i ha⁻¹ + 1 hoeing).

Keywords: Weed flora, soybean, weed control, pre-emergence herbicide, post-emergence herbicides and weather parameters, dates of sowing

Introduction

In India annual agriculture losses due to weeds accounts for 33 per cent which becomes biggest problem in agriculture sector. Depending upon type and weed intensity, yield reduction of 58-85 per cent is recorded if the weeds are not controlled during critical stage of crop weed competition. In *Kharif* season the weed computation is one of the most serious problem that cause low yield. The critical period of crop weed competition up to 45 DAS for soybean and yield reduction ranging from 10 – 85 per cent depending upon weed infestation was reported by Paneerselvam *et al.* and Lauduraj 2000.

The most problematic weeds in soybean viz., *Amaranthus viridis* L., *Phyllanthus niruri* L., *Digera arvensis* Forsk, *Cynodon dactylon*(L) Pers, *Echinochloa colonum*(L) Link.. For sustaining food grain production to feed ever-increasing population and ensuring food security, effective weed management is very essential. (Singh *et al.* 1993) ^[9].

The reduction in seed yield due to weed is more compare to other factors limiting the soybean production. It has been estimated that soybean grower lost an average of 1.8 million US\$ per year due to reduction from weed infestation (Soltani 2017) ^[10]. Sowing date is important factor affecting soybean growth, development and yield and quality of soybean (Barati, *et al.* 2013) ^[11]. Sowing dates also influences weed flora and its density, along with the crop growth. Considering these aspects this experiment was conducted to plan suitable control measure for weeds under different weather conditions in different dates of sowing.

Materials and Methods

The field experiment entitled on weed management in soybean (*Glycine max* L.Merrill) under varied weather conditions was carried out on black soil during *Kharif* season of 2021-22 at experimental farm, Department of Agronomy, College of Agriculture, and V.N.M.K.V Parbhani. The topography of the experimental plot was well uniform and levelled. The soil was deep and fairly well drained. The experiment was laid out in Split Plot Design with 3 replications and 12 treatments combination of three dates of sowing D₁(26MW), D₂ (28MW),

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D₃ (30MW) in main plot and four weed management practices W₁: PE Diclosulum 84% WDG@22-26g ai ha⁻¹ +1 Hoeing, W₂: PoE Sodium aceflurofen 16.5% + Clodinafop propargly 8%@ 80+165g ai ha⁻¹ W₃ (1Hand Weeding +1 Hoeing), W₄ (Unweeded control) in sub plot. The size of the gross and net plot was 5.4m x 4.5m and 4.5m x 4.2m respectively. The sowing was done as per treatments on 30/6/2021 (D₁), 15/7/2021(D₂) and 29/7/2021 (D₃) respectively. An area of a quadrat 1 m² was fixed in each experimental plot and observations on weed count for monocot and dicot weeds were recorded at different stages, these weeds were used for taking dry weight of weeds for further calculations.

Results and Discussion

Weed count for monocot and dicot weeds (m⁻²)

The data presented in Table 1 shown that, mean number of monocot weeds were influenced significantly by different treatments. At 15 DAS lowest number of monocot and dicot weeds were recorded with treatment PE Diclosulum @ 22 g a.i /ha (W₁). The highest count for monocot and dicot weeds were found under weedy check (W₄). At 15 DAS treatment PE Diclosulum @ 22 g a.i /ha (W₁) was significantly superior over W₃ hand weeding +1 hoeing and W₂PoE Sodium aceflurofen 16.5% + Clodinafop propargly 80% + 165g ai./h). At 30, 45, days after sowing the lowest monocot and dicot weed count was observed with treatment weed free + 1 hoeing (W₃) which was statistically at par with (W₂) PoE Sodium aceflurofen 16.5% + Clodinafop propargly 80% + 165g ai./h). Lower weed density of monocot and dicot weeds in weed free was due to periodically disturbances of soil by removal of weeds with the help of hand tools. Also, in treatments with post emergence herbicide, there was better control of weeds in stage of crop growth.

This might be due to better weed control observed over extended period with hand weeding and post emergence herbicide. Similar result found up to harvesting stage. Similar result reported in Kumar *et al.* (2017) [5].

Yield attributes of soybean

Effect of sowing dates

The data presented in table 2 showed that maximum number of pods plant⁻¹, seed yield per plant was recorded with the crop sown at D₁ (26MW) was significantly superior over rest of sowing dates D₂ (28 MW) and D₃ (30 MW). Similar result found Chen *et al.* (2010) [3]. The data on test weight of soybean was found to be nonsignificant.

Effect of weed management treatment

The highest values for yield attributes like number of pods plant⁻¹, seed yield per plant was achieved with W₃ (1 Hand weeding +1 hoeing), and was at par with PoE Sodium Aceflurofen 16.5% + Clodinafop Propargly 8%@80 + 165gai./ha. The results are in line with those reported by Pedersen, (2004) [12].

Effect of interaction

The interaction effect between treatments could not reach to the level of significance in influencing the number of pods plant⁻¹.

Seed yield kg ha⁻¹

Different treatment influenced the seed yield in crop significantly shown in table 2

Effect of date of sowing

The information in the table 2 showed that sown in D₁ (26 MW) recorded a greater seed yield and significantly superior to D₃ (30 MW) and D₂ (28 MW). This might be due to the evenly distributed rainfall, weather, and the temperatures during the critical crop growth stages in the first sowing date i.e., D₁ (26 MW). The lowest yields the third date of sowing (30 MW) which might be due to poor rainfall and moisture stress conditions during critical stages, which ultimately has an impact on crop growth. The results are parallel to those reported by Toum *et al* (2020) [4].

Effect of weed control treatment

The data showed that the seed yield was significantly influenced by different weed control treatments. The highest seed yield was achieved with 1 Hand weeding+1 hoeing and among chemical weed control treatments seed yield was highest with PoE Sodium Aceflurofen 16.5% + Clodinafop Propargly 8%@80 + 165g ai /ha significantly superior over rest of treatments. While treatment W₄ (Weedy check) had the lowest seed yield. Similar results were also reported by Bhalla *et al.* (1998) [2]. Similar trend was observed in straw and biological yield of soybean.

Interaction effect

The interaction effect between date of sowing and weed management practices on seed yield of soybean was found to be nonsignificant.

Table 1: Mean weed count (m⁻²) as influenced by different treatments at 15, 30 and 45 days after sowing

Treatment	Monocot			Dicot		
	15 DAS	30 DAS	45 DAS	15 DAS	30 DAS	45 DAS
Date of sowing						
D ₁ : (26MW)	12.1 *(3.6)	10.9 (3.4)	12.4 (3.6)	11.3 (3.5)	10.1 (3.3)	11.4 (3.5)
D ₂ : (28MW)	11.5 (3.53)	10 (3.3)	11.6 (3.5)	10.8 (3.4)	9.2 (3.1)	10.6 (3.4)
D ₃ : (30MW)	10.9 (3.4)	9.1 (3.1)	10.8 (3.4)	10.3 (3.3)	8.4 (3.0)	9.8 (3.2)
S.E.±	0.35	0.22	0.13	0.32	0.31	0.18
C.D. @5%	0.14	0.89	0.52	0.12	1.21	0.72
Weed management practices						
W ₁ : PE Diclosulum @ 22g a.i/ha	6.5 (2.7)	9.6 (3.0)	9.7 (10.7)	5.7 (2.5)	8.9 (3.14)	8.7 (3.1)
W ₂ : PoE Sodium aceflurofen 16.5% + Clodinafop propargly 80% +165g ai./ha	12.5 (3.6)	6.5 (2.7)	7.5 (2.9)	11.7 (3.5)	5.8 (2.6)	6.8 (7.8)

W ₃ : Hand weeding + Hoeing	11.5 (3.5)	5.6 (2.5)	6.9 (2.8)	10.8 (3.4)	4.8 (2.4)	6.0 (2.6)
W ₄ : Weedy check	15.5 (4.0)	18.4 (4.4)	22.5 (4.8)	14.9 (3.9)	17.4 (4.2)	21.5 (4.7)
S.E.±	0.33	0.30	0.20	0.33	0.33	0.26
C.D. @5%	0.99	0.90	0.61	0.98	1.00	0.80
Interaction effect						
S.E.±	0.57	0.65	0.55	0.72	0.53	0.59
C.D @5%	NS	NS	NS	NS	NS	NS
G.M	11.5	10.0	11.6	10.8	9.2	10.6

*The value in parenthesis are transformed by $\sqrt{x+1}$

Table 2: Seed yield (kg ha⁻¹), Straw yield (kg ha⁻¹), and biological yield (kg ha⁻¹) as influenced by different treatments in soybean

Treatment	No. of pods plant ⁻¹	Seed yield plant ⁻¹	Seed yield (kg ha ⁻¹)	Biological yield (kg ha ⁻¹)	Straw yield (kg ha ⁻¹)	Test weight (g)
Date of sowing						
D ₁ : (26MW)	30.33	13.6	1829	4544	2752	88.8
D ₂ : (28MW)	25.16	9.9	1654	3350	2125	88.5
D ₃ : (30MW)	21.83	8.5	1232	2807	1920	87.7
S.E.±	0.24	0.22	44.70	75.37	91.47	0.26
C.D. @5%	0.94	0.89	175.51	295.92	359.11	NS
Weed control treatment						
W ₁ : PE Diclosulum @ 22g a.i/ha	28	10.5	1344	3585	2249	88.4
W ₂ : PoE Sodium aceflurofen 16.5% + Clodinafop propargly 80% +165g ai./h	30.2	12.0	1532	3845	2346	88.4
W ₃ : Hand weeding + Hoeing	32.55	12.7	1609	4108	2522	88.7
W ₄ : Weedy check	23.00	7.4	963	2729	1919	87.9
S.E.±	0.78	0.21	26.39	75.37	60.36	0.29
C.D. @5%	2.33	0.62	78.42	265.46	179.35	NS
Interaction effect						
S.E.±	1.36	0.36	45.71	154.74	104.55	0.51
C.D @5%	NS	1.09	135.82	NS	310.65	NS
G.M	20.44	10.7	1362.5	3567.4	2266.1	88.3

Conclusion

From one year experiment, it can be concluded that among the three dates of sowing, D₁ (26MW) recorded better growth and yield of soybean as compared to delayed sowing dates. While among the different treatments of weed management in soybean, the treatment PoE Sodium aceflurofen 16.5% + Clodinafop propargly 80% + 165g ai./ha. Was found effective in controlling weed flora in soybean and found highly productive and profitable as compared to other treatments.

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