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Effect of integrated weed management on yield and economics of soybean in Satpura plateau region of Madhya Pradesh

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Abstract
The field experiment was carried out at Chhindwara, during the *Kharif* season of 2016 and 2017 with a view to study the effect of integrated weed management on yield and economics of soybean in Satpura plateau region of Madhya Pradesh. The results indicated that the lowest density of weeds 12/m^2 was found in weed free treatment followed by pendimethalin (pre emergence) + hand weeding (16/m^2). The hand weeding at 20 and 40 DAS proved more effective as it reduced weed population to the turn of 15/m^2 over other treatments. The mean maximum number of pods/plant (69), number of pods/m^2 (1193), number of seeds/pod (2.65) and test weight (12g/100 grains) were recorded in weed free treatment. The same treatment also resulted in mean highest biological yield (7.00 t/ha), harvest index (36%), seed yield (2.58 t/ha) and straw yield (4.46 t/ha) with net profit INR 56425/ha (USD 869.02/ ha) and B:C ratio 2.54. This was followed by the treatment of pendimethalin 1.0 kg/ha + one hand weeding at 40 DAS resulting in better effect on different parameters, yield and economics. Weedy check (control) plot showed the lowest effect on different parameters, yield and economics of soybean crop. The findings suggested that twice stale seed bed preparation may be followed for higher yield and net economic return of soybean crop.

Keywords: Weed, soybean, fluchloralin, pendimethalin, stale seed bed preparation

Introduction
Soybean (*Glycine max* L.) is an important protein and mineral source for human food and livestock feed. It is an excellent health food containing 40 to 44% good quality protein, 20% cholesterol free oil, 20% carbohydrates and 0.69% phosphorus. It also fixes atmospheric nitrogen (45 to 60 kg/ha) through root nodules and adds organic matter about 0.5 to 1.5 tons/ha through leaves fall (Kanase *et al*. 2006) [1]. Now a day's farmers are showing increasing interest in the use of herbicides for controlling weeds with the urge of reducing cost of cultivation owing to shortage and high cost of labour. Therefore, chemical weed control is necessary to decrease cost and to increase net profit. This crop is a large herbicide consumer, and almost 90% of the planted area in India is herbicide treated. The advantages of herbicide use are high efficiency in weed control, the presence of selective products for soybean at the lowest cost, compared to other available weed control methods. Regarding chemical weed control, selective herbicides may be effective against annual weeds and to achieve high soybean. Due to unavailability of labour at the time of requirement and increasing wages pose a problem in soybean production. Despite the satisfactory weed control results; there may be the effect of herbicides on the N_2 fixation process, since the soybean crop is dependent on symbiosis with Brady rhizobium. It undergoes heavy weed competition especially in the early growth stages of crop. Keeping in view of above facts the field experiment was conducted to examine the effects of different herbicides, applied as pre-emergence on weed infestation, yield and yield attributes of soybean plants.

Materials and Methods
Two-year field study was conducted at Jawaharlal Nehru Krishi Vishva Vidyalay, Krishi Vigyan Kendra, Chhindwara, Madhya Pradesh (India) in the Kharif seasons of 2016 and 2017. The site was located at 675 m MSL with North latitude 22^0 1' 55" and South longitude 78^0 55' 49". The soil of the experimental field was sandy loam with neutral pH (7.4) and EC (0.43 dSm^1), medium in organic carbon, medium in available nitrogen and potash and low in phosphorous.

The experiment was laid out in a split pot design with 10 treatments and three replications. The treatments consisted of ten weed control methods namely *viz.* weedy check, one hand weeding (HW) 20 DAS, 2 HW 20 and 40 DAS, pre-plant incorporation of fluchloralin 1.0 and 1.5 kg/ha pendimethalin 1.0. kg/ha, Imazethapyr 1.0 kg/ha**,** quizalofop - ethyl 1.0 kg/ha, pendimethalin 1.0. kg/ha + 1 HW 40 DAS and stale seed bed preparation (weed free) When soil moisture became adequate (3 to 4 days) later the seeds of soybean cv. JS 20-69 were sown on hill 45 cm apart on both sides of the ridge. The sowing was done on 20 June during the year 2016 and 2017. After complete germination, soybean seedlings were thinned to secure two plants per hill. Nutrients 20 nitrogen, 60 phosphorus, 20 potash and 25 zinc sulphate kg/ha were supplied through urea, single super phosphate, muriate of potash, respectively as a basal dose at the time of sowing. One life saving irrigation was provided at pre flowering stage. All recommended practices were adopted till harvesting of soybean crop. Observations were recorded on density of weeds number of pods per plant, pod weight per plant (g), number of seeds per plant, seed yield per plant (g), seed yield (kg/ha), biological yield per plant (g) and 100-seeds weight (g). Data on total rainfall, humidity, maximum and minimum temperature was recorded for different parameters and subjected to statistical analysis as per the method of analysis of variance. Predominant weeds with images are given in figures. Weed species observed in the experimental field were *Parthenium hysterophorus, Euphorbia geniculata, Euphorbia hirta, Tridex procumbense, Corchorus acutangulus, Alternanathera species, Digera arvensis and Celosia argentea* among the dicot weeds *and Cyperus rotundus, Dinebra arabica, Poa annua, Echinochloa crusgalli, and Eragrostis were* observed among the monocot. The crop was harvested at maturity and yield data recorded and statistically analyzed to draw suitable inferences.

Fig 1: Weed dominance in research plots of soybean in 2016 and 2017

Results and Discussion

The data related to observation on different parameters are presented in Table 1, 2, 3 and 4. The weed flora observed was grouped into broad leaf weeds, grassy weeds and sedges. Zablotowicz and Reddy (2007) [9] stated that physiological and yield responses of soybean to a herbicide may vary, and may also depend on geographical location, environmental conditions, soil type, sensitivity of native populations of *Bradyrhizobium japonicum* etc. Significant differences were observed in function of weed management practices, on yield of soybean and its attributing parameters.

Weed population

Minimum density of weeds (12) was recorded in weed free treatment (Table 1) over rest of the treatments, followed by the treatment of pendimethalin 1.0 kg/ha + one hand weeding at 40 DAS (16) at 18 DAS. Maximum population of *Cynodon dactylon, Commelina bengalensis, Oplimenus compestus and Oxalis martiana* were observed, respectively. At 38 DAS lowest population (15) was found in two hand weeding at 20 and 40 DAS followed by weed free treatment (19). However, the highest weed density 86 and 131 was recorded in weedy check at 18 and 38 DAS, respectively.

Number of pods/plant and /m^2

Results showed that maximum number of pods/plant, number pod/m^2 was produced by twice stale seed bed preparation *i.e.* weed free over other treatments. This treatment resulted in maximum effect on phenological parameter *i.e.* number of pods 68, 70 and 69 per plant, number of pods 1174, 1212 and 1193 /m^2 during 2016, 2017 and mean, respectively (Table 2). The number of pods of soybean was remarkably reduced when applied Imazethapyr 1.0 kg/ha and one hand weeding at 20 DAS being at par with 52 pods/plant, other weed control treatments also affected significantly giving higher number of pods as compared to weedy check. Severe weed competition in the weedy check might have reduced the number of pods per plant. Weed free treatment produced 38.23 and 38.57% extra pods than control as reported by Thakare *et al.* (2006). This is clearly indicative of more pronounced effect of their integrated use because of the fact that initial achievement of limiting weed growth by the herbicides is maintained as hand weeding eliminates the fresh flush of weeds that may regenerate due to loss of persistence of the applied herbicides as in the case of herbicides applied alone. A number of researchers like (Singh and Jolly, 2004) [6] held similar views and reported more pods with integrated use of herbicides with hand weeding. Herbicides applied alone recorded pods at par with hand weeding once at 20 DAS and Imazethapyr 1.0 kg/ha by mean value. Number of pods per unit area was significantly influenced by different weed control measures. Two-time stale seed bed technique and hand weeding twice (2 HW 20 and 40 DAS) affected number of pods /m^2 that were at par with each other. Herbicides applied individually and in integration with one hand weeding at 40 DAS also caused significant enhancement with number of pods 1193 m^2 as compared to (775/m^2) un-weeded plot.

Number of seed/pod and test weight

Number of seed 2.50, 2.80 and 2.65 per pod, 100 seeds weight 11, 12 and 12 (g) and biological yield 6.90, 7.10 and 7.00 (t/ha) during 2016, 2017 and mean, respectively were recorded with weed free treatment as compared to other treatments. The number of seeds per pod and 100-seed weight was influenced by various weed control measures. Weed free treatment and hand weeding twice at 20 and 40 days after sowing were at par with each other in producing significantly

highest number of seeds per pod and also affecting highest 100-seed weight. Un-checked growth of weeds in weedy check caused lowest number of seeds per pod and lowest 100-seed weight. Hand weeding twice at 20 and 40 DAS and twice stale seed bed preparation-weed free was found statistically at par with respect to the number of seeds/pod and 100-seed weight. Herbicides applied alone too had a significant promising influence on test weight giving higher values than the weedy check. Reduced weed competition as a consequence of weed control measures enabled to affect improved 100-seed weight in soybean possibly due to enhanced availability of nutrients etc. (Senthil Kumar, 2019) [4].

Biological yield

Biological yield 6.60, 6.80 and 7.70 t/ha during 2016, 2017 and mean, respectively in treatment two hand weeding at 20 and 40 DAS was recorded being at par to the treatment of pendimethalin 1.0 kg/ha + one hand weeding at 40 DAS giving similar results. Non-significant differences were observed among treatments. The results are similar in findings with to those reported by Sha (2004) [5]. Biological yield was favorably influenced by various weed control treatments.

Harvest Index

Harvest index of soybean exhibited pronounced influence of various weed control treatments. Weed free treatment, hand weeding twice and pendimethalin 1.0 kg/ha in integration with hand weeding once produced statistically similar harvest index. Weedy check affected significantly least harvest index compared to all the weed control treatments. The higher doses of both fluchloralin and pendimethalin proved significantly more effective than their corresponding low doses (pre-plant incorporation of fluchloralin 1.0 and, pendimethalin 1.0 kg/ha). This was possibly due to persistence of these herbicides for longer duration at the higher concentration compared to their lower ones. Kushwah and Vyas (2005) [2] also reported superiority of various weed control methods with respect to harvest index of soybean over un-weeded plot.

Seed yield

The highest significant seed yield of 2.59, 2.56 and 2.58 t/ha was recorded in the treatment of weed free followed by the treatment pendimethalin 1.0 kg/ha + one hand weeding at 40 DAS producing 2.55, 2.50 and 2.53 t/ha during 2016, 2017 and mean, respectively over weedy check (Table 3). However, twice stale seed bed preparation-weed free, pendimethalin 1.0 kg/ha + one hand weeding at 40 days after sowing and twice hand weeding at 20 and 40 days after sowing procured far superior seed yields of soybean. The increase in seed yield due to these treatments (Two-time stale seed bed technique, Pendimethalin 1.0 kg/ha + 1 HW 40 DAS and 2 HW 20 and 40 DAS) on pooled basis was to the tune of 2.58, 2.53 and 2.50 q/ha, respectively over the weedy check. Pendimethalin when applied alone or integrated with hand weeding was more effective than application of fluchloralin. The use of pendimethalin with hand weeding resulted in seed yield 27.77% more than other combination of pendimethalin applications. Higher doses at 1.5 kg/ha of fluchloralin proved more effective and produced superior seed yield than their lower doses (1.0 kg /ha), the increase being 5.26% for fluchloralin. The yield given by Imazethapyr 1.0 kg/ha was comparable to that produced by hand weeding once in both the year. Higher seed yield given by quizalofop-ethyl 1.0 kg/ha was comparable to other treatments (weedy check, one hand weeding (HW) at 20 DAS, pre-plant incorporation of fluchloralin 1.0 and 1.5 kg/ha, pendimethalin 1.0 kg/ha, imazethapyr 1.0. kg/ha) in both the years. The enhancement in the seed yield due to various weed control measures was because of the fact that they helped to keep the field comparatively free from weeds, thus resulting in better utilization of resources namely, nutrients, moisture, solar light and space etc. This consequently led to the production of more vigorous and healthy plants having more pod bearing capacity, more seed per pod and 100-seed weight. The cumulative effect of all these resulted in higher seed yields, making it amply clear that these weed control measures exerted a profound influence in curtailing the weed population and thereby reducing the weed biomass at important growth stages of the crop. The results corroborate the findings of Pandya *et al.* (2005) [3] and many others who reported enhanced soybean yield due to various weed control treatments. Weedy check produced lowest yield of soybean which was significantly inferior to different weed control treatments. Drastic yield reduction in weedy check was due to heavy infestation of weeds, especially broad leaved weeds which grow faster and suppressed the crop growth, thus causing reduced yields. The broad leaved weeds on an average were higher in population than narrow leaved weeds.

Straw yield

The data further indicated that the highest straw yield was recorded 4.42, 4.50, and 4.46 t/ha in weed free treatment followed by two HW at 20 and 40 DAS which resulted in 4.24, 4.33 and 4.29 t/ha during 2016, 2017 and mean, respectively over weedy check. Significantly, superior straw yield was seen in different weed control treatments especially twice in stale seed bed preparation-weed free (4.46 t/ha) Quizalafop ethyl 1.0 kg/ha (4.35 t/ha) followed by pendimethalin 1.0 kg/ha with two hand weeding at 20 and 40 DAS (4.29 t/ha). The straw yield depicted a trend similar to seed yield. Significantly superior straw yield was seen in different weed control treatment especially twice stale seed bed preparation-weed free and two hand weeding at 20 and 40 days after sowing and pendimethalin 1.0 kg/ha with one hand weeding at 40 days after sowing. The results also corroborated findings of Yadav *et al.* (2017) [8] who evaluated the efficacy of pendimethalin applied as pre-emergence followed by post-emergence application of imazethapyr + imazamox / quizalofop-ethyl for weed control and their effect on conventional production of soybean yield and yield attributes parameters.

Economics

Data presented in Table 4 revealed that the highest cost of cultivation was noted in 2 HW at 20 and 40 DAS giving INR 25610/ha (USD 395.49/ha) as compared to INR 24710/ha (USD 380.63/ha) in pendimethalin 1.0 kg/ha + 1 HW at 40 DAS and INR 24074/ha (USD 370.76/ha) treatment. The highest gross return was observed as INR 78660 /ha (USD 1211.65/ha) in weed free treatment closely followed by INR 77000/ha (USD 1186.06/ha) in two-time hand weeding at 20 and 40 DAS technique over weedy check of INR 47580/ha (USD 732.90). Maximum mean value of net return of INR 56430/ha (USD 869.15/ha) was recorded in weed free treatment. The next in order was INR 52290/ha (USD

805.57/ha) with pendimethalin 1.0 kg/ha + 1 HW at 40 DAS over weedy check with INR 28170/ha (USD 433.90/ha). The highest B: C ratio of 2.54 was recorded in weed free treatment followed by pendimethalin 1.0 kg/ha + 1 HW at 40 DAS giving 2.12 B: C ratio. The lowest B:C ratio of 1.43 was obtained in weedy cheek thereby indicating that weed population drastically affected yield and thereby monetary return.

Table 1: Observation on weed population (m^2) in different treatments at 18 and 38 days after sowing in 2016 and 2017

Treatments	Weed population at 18 DAS											Weed population at 38 DAS										
	1	2	3	4	5	6	7	8	9	10	Total	1	2	3	4	5	6	7	8	9	10	Total
Weedy check	17	6	15	2	10	9	6	2	8	11	86	21	9	13	9	15	12	10	9	16	17	131
1 HW 20 DAS	18	5	13	3	16	8	3	9	5	9	89	9	2	5	0	2	6	2	6	3	4	39
2 HW 20 and 40 DAS	2	2	3	5	1	1	1	2	1	0	20	1	2	1	2	1	2	1	2	3	0	15
Fluchloralin 1.0 kg/ha	6	3	3	0	0	0	3	2	2	3	22	8	5	7	0	0	2	6	5	4	5	42
Fluchloralin 1.5 kg/ha	2	1	2	5	0	3	2	4	1	4	24	6	6	5	2	0	3	5	6	4	4	41
Pendimethalin 1.0 kg/ha	1	2	0	0	1	2	8	4	3	5	26	5	3	3	5	4	3	2	3	5	5	38
Imazethepyr 1.0 kgha	16	6	9	7	13	10	6	3	6	10	86	0	6	9	7	2	2	1	0	0	0	27
Quizalofop-ethyl 1.0 kg/ha	11	9	16	6	9	15	0	3	4	0	73	1	4	3	2	2	0	0	5	3	0	20
Pendimethalin 1.0 kg/ha + 1 HW 40 DAS	0	3	0	0	0	2	3	1	2	5	16	2	2	0	1	0	3	4	2	6	3	23
Two time stale seed bed technique (weed free).	3	1	1	1	0	3	1	2	0	0	12	2	4	5	0	2	1	0	1	3	1	19

1. Cynodon dactylon 2. Lagascea mollis 3. Commelina benghalensis 4. Caesulia axillaris 5. Oxalis martiana 6. Oplismenus composites
7. Lagasca mollis 8. Ocimum sanetum 9. Ageratum conyzoides and 10. Brachiaria reptans

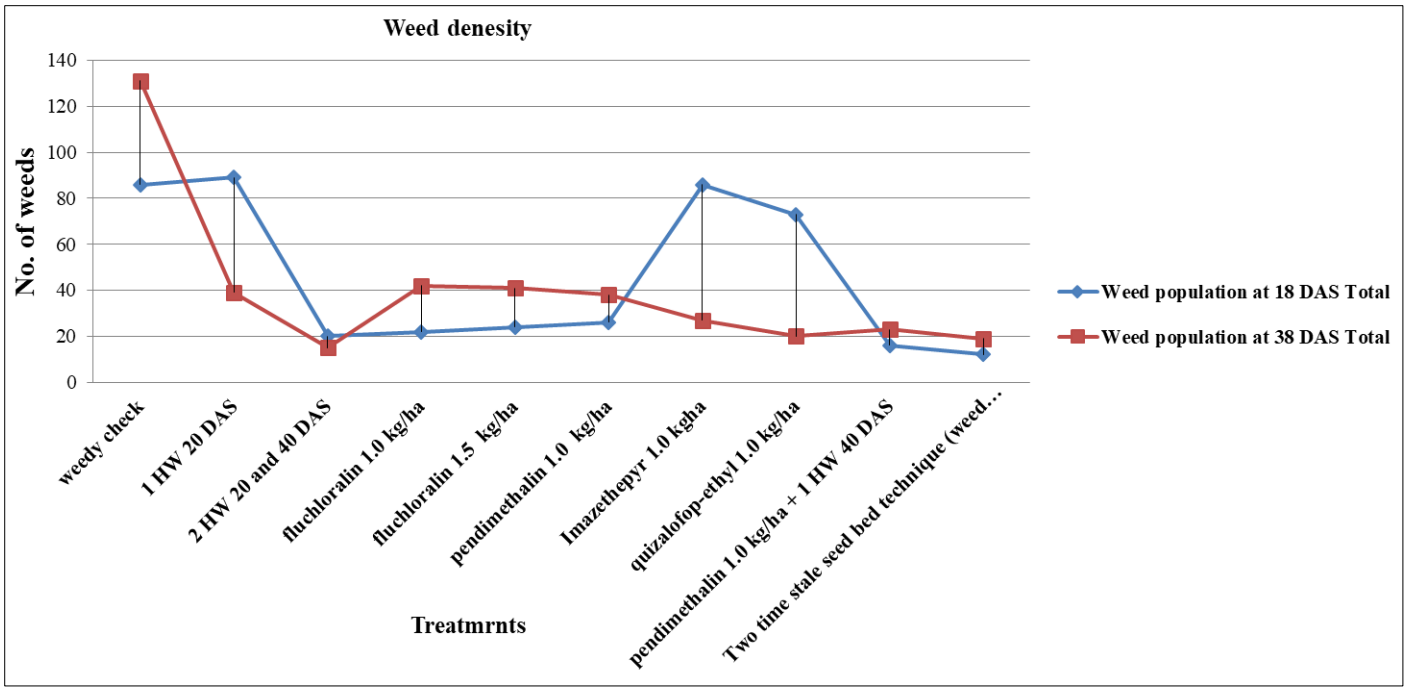

Fig 2: Weed density at 18 and 38 DAS in soybean crop in 2016 and 2017

Table 2: Yield attributing parameters of soybean as influenced by different treatments in 2016 and 2017

Treatments	No. of pods/plant			No. of pods/m^2			Seeds/pod (No.)			100-seed weight (g)			Biological yield (t/ha)			Harvest index (%)		
	2016	2017	Mean	2016	2017	Mean	2016	2017	Mean	2016	2017	Mean	2016	2017	Mean	2016	2017	Mean
Weedy check	42	43	42	757	793	775	1.80	1.80	1.80	10	10	10	4.70	4.70	4.70	18	20	19
1 HW 20 DAS	50	54	52	1085	1054	1070	2.10	2.20	2.15	11	10	10	5.80	5.90	5.90	35	35	35
2 HW 20 and 40 DAS	60	65	62	1162	1182	1172	2.30	2.40	2.35	11	12	12	6.60	6.80	6.70	36	36	36
Fluchloralin 1.0 kg/ha	51	50	51	965	999	982	2.00	2.00	2.00	11	11	11	5.50	5.70	5.60	34	34	34
Fluchloralin 1.5 kg/ha	46	49	48	1002	953	978	1.90	2.00	1.95	11	11	11	5.70	5.80	5.80	35	35	35
Pendimethalin 1.0 kg/ha	47	50	48	926	958	942	2.00	1.90	1.95	11	11	11	5.50	5.60	5.60	35	36	36
Imazethapyr 1.0 kg/ha	51	53	52	948	1014	981	2.10	2.00	2.05	11	11	11	5.80	6.00	5.90	36	36	36
Quizalofop-ethyl 1.0 kg/ha	58	63	60	1052	1139	1096	2.20	2.30	2.25	11	11	11	6.30	6.20	6.30	35	35	35
Pendimethalin 1.0 kg/ha + 1 HW 40 DAS	60	61	60	1085	1129	1107	2.30	2.20	2.25	11	11	11	6.50	6.70	6.60	36	36	36
Two time stale seed bed technique (weed free).	68	70	69	1174	1212	1193	2.50	2.80	2.65	11	12	12	6.90	7.10	7.00	36	36	36
LSD (p =0.05)	6.4	8.62	7.51	60.1	68.24	64.17	0.2	0.22	0.21	0.68	0.74	0.71	0.93	0.94	0.93	0.9	0.95	0.92

Table 3: Seed yield and straw yield of soybean as influenced by different treatments in 2016 and 2017

Treatments	Seed yield (t/ha)			Straw yield (t/ha)		
	2016	2017	Mean	2016	2017	Mean
Weedy check	1.57	1.55	1.56	3.28	3.02	3.15
1 HW 20 DAS	2.19	2.11	2.15	3.74	3.82	3.78
2 HW 20 and 40 DAS	2.50	2.49	2.50	4.24	4.33	4.29
Fluchloralin 1.0 kg/ha	1.90	1.90	1.90	3.59	3.73	3.66
Fluchloralin 1.5 kg/ha	1.98	2.01	2.00	3.69	3.82	3.76
Pendimethalin 1.0 kg/ha	1.95	2.00	1.98	3.59	3.57	3.58
Imazethapyr 1.0 kgha	2.07	2.10	2.09	3.70	3.81	3.76
Quizalofop-ethyl 1.0 kg/ha	2.21	2.18	2.20	4.70	4.00	4.35
Pendimethalin 1.0 kg/ha + 1 HW 40 DAS	2.55	2.50	2.53	4.15	4.25	4.20
Two time stale seed bed technique (weed free).	2.59	2.56	2.58	4.42	4.50	4.46
LSD (p = 0.05)	0.66	0.81	0.70	0.71	0.75	0.73

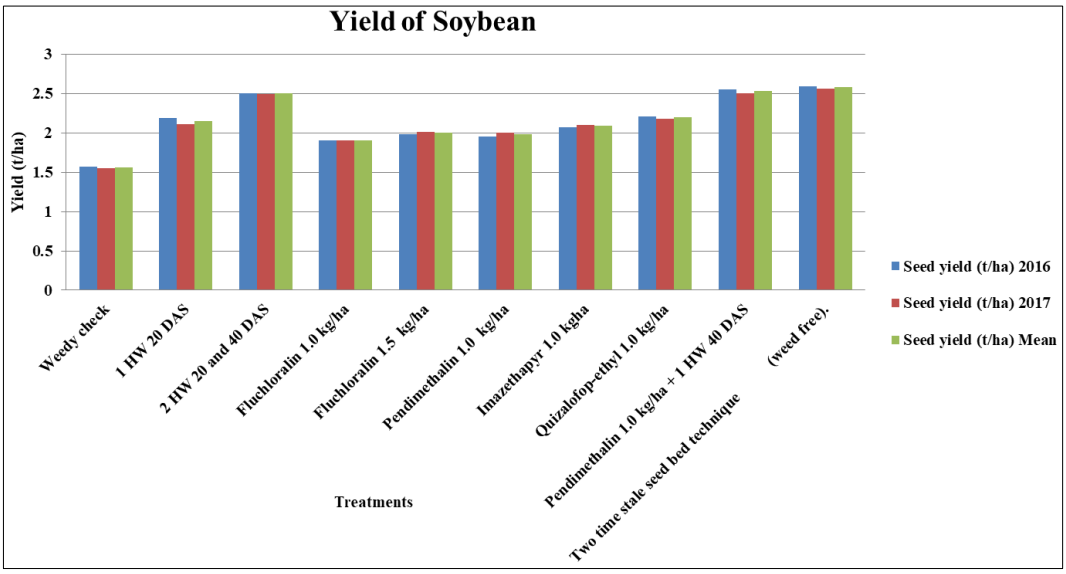

Fig 3: Effect of different treatments on yield of soybean in 2016 and 2017

Table 4: Effect of different treatments on economics of soybean in 2016 and 2017

Treatments	Cost of cultivation ($X10^3$ /ha)			GMR ($X10^3$ /ha)			NMR ($X10^3$ /ha)			B:C ratio		
	2016	2017	Mean	2016	2017	Mean	2016	2017	Mean	2016	2017	Mean
Weedy check	19.85	19.98	19.92	47.73	47.43	47.58	28.85	28.10	28.48	1.45	1.41	1.43
1 HW 20 DAS	22.65	22.76	22.71	66.64	64.36	65.50	43.99	41.60	42.79	1.94	1.83	1.88
2 HW 20 and 40 DAS	25.48	25.74	25.61	75.64	76.07	75.85	50.16	50.33	50.25	1.97	1.96	1.96
Fluchloralin 1.0 kg/ha	23.42	23.62	23.52	56.67	57.95	57.31	33.85	34.14	34.00	1.45	1.45	1.45
Fluchloralin 1.5 kg/ha	23.64	23.87	23.75	60.39	61.34	60.86	36.75	37.47	37.11	1.55	1.57	1.56
Pendimethalin 1.0 kg/ha	23.97	24.18	24.07	59.54	61.00	60.27	35.57	36.82	36.19	1.48	1.52	1.50
Imazethapyr 1.0 kg/ha	23.86	23.99	23.92	63.23	64.26	63.75	39.37	40.28	39.83	1.65	1.68	1.66
Quizalofop-ethyl 1.0 kg/ha	23.85	23.99	23.92	67.41	66.46	66.93	43.56	42.47	43.01	1.83	1.77	1.80
Pendimethalin 1.0 kg/ha + 1 HW 40 DAS	24.56	24.86	24.71	77.62	76.37	77.00	53.06	51.51	52.29	2.16	2.07	2.12
Two time stale seed bed technique (Weed free).	21.85	22.62	22.24	79.24	78.08	78.66	57.39	55.46	56.43	2.63	2.45	2.54

Conclusion

On the basis of results, it could be inferred that twice stale seed bed preparation and pendimethalin 1.0 kg/ha and one hand weeding at 40 DAS showed better effect through control of weeds for achieving high yield of soybean crop. Thus, efficient weed management can help in increasing the farmers' income by reducing the losses caused by weeds, decreasing the cost of production, and increasing the productivity through efficient utilization of resources.

References

1. Kanase AA, Mendhe SN, Khawale VS, Jarande NN, Mendhe JT. Effect of integrated nutrient management and weed biomass addition on growth and yield of soybean. Journal of Soils and Crops. 2006;16(1):236-239.
2. Kushwah SS, Vyas MD. Herbicides weed control in soybean (Glycine max). Indian Journal of Agronomy. 2005;50(3):225-227.
3. Pandya N, Chouhan GS, Nepalia V. Effect of varieties, crop geometries and weed management on nutrient uptake by soybean (Glycine max) and associated weeds. Indian Journal of Agronomy. 2005;50(3):218-220.
4. Senthil Kumar D, Murali Arthanari P, Chinnusamy C, Bharathi C, Yalabela Lavanya. Stale seed bed techniques assuccessful weed management practice. Journal of Pharmacognosy and Phytochemistry. 2019;SP2:120-123.

5. Sha HZ. Test on the efficacy of 40% emulsifiable concentrate of prometryn and acetochlor against soybean weeds. Journal of Jilin Agriculture University. 2004;26(4):452-454.
6. Singh G, Jolly RS. Effect of herbicides on the weed infestation and grain yield of soybean (Glycine max). Acta Agronom0y, Hungarica. 2004;52(2):199-203.
7. Thakare KG, Chore CN, Deotale RD, Kamble PS, Sujata BP, Shradha RL. Influence of nutrients and hormones on biochemical characteristics and yield contributing parameters of soybean. Journal of Soils and Crops. 2006;16(1):210-216.
8. Yadav MS, Bhullar S, Kaur T, Jhala AJ. Weed control in conventional soybean with pendimethalin followed by imazethapyr + imazamox/quizalofop-p-ethyl. Canadian Journal of Plant Science. 2017;97(4):654-664.
9. Zablotowicz RM, Reddy KK. Nitrogen activity, nitrogen content and yield responses to glyphosate in soybean crop. Crop Protection. 2007;26(1):37.