Journal of Pharmacognosy and Phytochemistry

Available online at www.phytojournal.com

E-ISSN: 2278-4136
P-ISSN: 2349-8234
JPP 2018; 7(3): 1912-1915
Received: 13-03-2018
Accepted: 17-04-2018

Priyanka Kumari
Department of Agronomy, Forages and Grassland Management, CSK Himachal Pradesh Krishi Vishvavidyalaya, Palampur, Himachal Pradesh, India

Jiwan Prakash Saini
Department of Agronomy, Forages and Grassland Management, CSK Himachal Pradesh Krishi Vishvavidyalaya, Palampur, Himachal Pradesh, India

Correspondence
Priyanka Kumari
Department of Agronomy, Forages and Grassland Management, CSK Himachal Pradesh Krishi Vishvavidyalaya, Palampur, Himachal Pradesh, India

Weed management in organically grown wheat under mid-hill conditions of north-west Himalayas

Priyanka Kumari and Jiwan Prakash Saini

Abstract
A field experiment was conducted on Model Organic farm of CSKHPKV, Palampur with 42 treatments of seed bed manipulations and weed management with an objective to study weed management in organically grown wheat during *rabi* 2015-16. The Interaction effects of seed bed manipulations and weed management methods were found significant on total weed dry weight and wheat equivalent yield. Stale seed bed resulted in significantly lower total weed dry weight over standard seed bed. However, standard seed bed recorded 8.22 per cent higher wheat equivalent over stale seed bed. In stale seed bed, two manual hoeings being at par with gram intercropping + one manual hoeing produced significantly highest wheat equivalent yield as compared to other treatments. Gram intercropping + one manual hoeing being statistically at par with two manual hoeings recorded significantly lower total weed dry weight, higher weed control efficiency and wheat grain equivalent yield.

Keywords: organically grown, wheat, north west himalaya

Introduction
Wheat (*Triticum aestivum* L.) is foremost among cereals and indeed among all crops, as direct source of food for human beings. India is the second largest producer of wheat in the world after China. The wheat production in India has touched a new height of 93.50 million tonnes in 2015-16. In Himachal Pradesh, it raised to total production of 646.46 thousand tonnes in 2014-15. Wheat (*Triticum aestivum* L.) is a versatile crop, growing across a range of agro-ecological zones and gets infested with variety of weeds. Weed management is a key issue in organic farming system. Weeds reduce crop yield not only by competing for necessary growth factors such as water, nutrients, light and space, but also by releasing allelochemicals in the rhizosphere through their roots or other plant parts. On an average 24-40 per cent grain yield losses are associated with weed infestation. Oad *et al.* (2007) [6]. Emergence of herbicide resistant weed species is threatening sustainable farming production and has resulted in enlarged economic losses. Naeem *et al.* (2012) [4]. So, there is a strong need to discover the alternative weed management options in organic agriculture. Economou *et al.* (2002) [1]. Different cultural and mechanical practices can provide a sigh of relief for the growers with no chemical application in agriculture. Stale seed bed conditions by pre-sowing irrigation or rainfall induce sprouting of weeds and subsequent harrowing makes land free from weeds in initial stages of growth. (Yadav *et al.* (1995) [9]. Intercropping within the organic agricultural production has an important role in weed control. Intercropping has a great potential in reducing weed infestation especially in farming system with low external input. Intercropping use resources more effectively than a monoculture and thus decrease the amount available for weeds use. (Yadollhi *et al.* (2014) [8]. Keeping in view the negative effects of herbicides, and increasing demand of organic products, the present investigation was therefore, conducted to study weed management in organically grown wheat under mid-hill conditions of north-west Himalayas.

Material and Methods
A field experiment was conducted during *rabi* 2015-16 at the Model Organic Farm of Chaudhary Sarwan Kumar Himachal Pradesh Krishi Vishvavidyalaya, Palampur, India. The soil of the experimental site was silty clay loam in texture, acidic in reaction, low in available nitrogen, high in available phosphorus and medium in available potassium. The experiment was laid out in split plot design with three replications comprising of seed bed manipulations (standard and stale seed bed) in main plots and 7 weed management practices (one manual hoeing, two manual hoeings, gram intercropping (no weeding), gram intercropping + one manual hoeing, natural farming (mulching),

natural farming (gram intercropping + mulching) and weedy check) in sub plots. Wheat variety HPW 155 was sown following all organic package of practices except the natural farming treatments. Weed population and weed dry weight were recorded at 120 days after sowing using 50cm x 50 cm quadrate.

Results and Discussion

Effect on weeds

Weed flora

The major weed flora of the experimental plots consisted of *Phalaris minor* Retz., *Avena fatua* L., *Lolium temulentum* L. and *Poa annua* L. among grasses; *Anagallis arvensis* L. and *Vicia sativa* L. among broad leaf weeds. On an average, the grasses and broadleaf weeds constituted 79.7 and 13.6 per cent of total weed population. The other weed species included *Coronopus didymus* L., *Trifolium* sp. and *Briza minor* L. which together constituted 6.7 per cent of the total weed flora.

Effect of seed bed manipulations

Stale seed bed resulted into significantly lower total weed dry weight and higher weed control efficiency (Table 1) over standard seed bed. Stale seed bed attributed lower weed biomass due to the fact that it produced suitable conditions in the field for germination of weeds that emerged and uprooted during final seed bed preparation, thus minimized weed seed bank in the soil. Safar *et al*. (2011) [7].

Effect of weed management

Among different weed management treatments, gram intercropping + one manual hoeing and two manual hoeings being (Table 1) statistically at par with each other produced significantly lower total weed dry weight and highest weed control efficiency over all other treatments. Intercropping decreased weed biomass due to the effective utilization of resources and weed smothering ability of the legumes due to profuse canopy resulted in higher weed control efficiency. Nongmaithem *et al.* (2012) [5].

Effect on crop

Wheat yield attributes

The number of effective tillers (Table 2) were significantly higher in standard seed bed over stale seed bed. The possible cause for decreased number of effective tillers under stale seed bed was due to delay in sowing to control weeds. Mumtaz *et al*. (2015) [3]. The other yield attributes *viz*. number of grains per spike and 1000 grain weight did not vary significantly due to standard/stale seed bed condition. Among weed management treatments, two manual hoeings resulted in significantly more number of effective tillers per square meter. Gram intercropping + one manual hoeing behaved statistically similar to it in recording significantly more number of grains per spike as compared to other treatments. The different treatments under weed management could not significantly influence the 1000 grain weight. This might be due to more effectiveness of two manual hoeings treatment to control weeds and less crop weed competition that resulted into more number of effective tillers per square meter. However, the elimination of one row in replacement series reduced plant population of wheat per unit area and thus reduced number of tillers per square meter under intercropping system.

Wheat equivalent yield

Effect of seed bed manipulations

Standard seed bed resulted in (Table 2) significantly higher wheat equivalent yield as compared to stale seed bed. The increase in equivalent yield in standard seed bed was to the tune of 8.22 per cent over stale seed bed. Lower wheat equivalent yield under stale seed bed was due to less number of effective tillers m^{-2}, less number of grains per spike and 1000 grain weight.

Effect of weed management

Among the different weed management treatments, gram intercropping + one manual hoeing being statistically at par with two manual hoeings (Table 2) recorded significantly highest wheat grain equivalent yield over rest of the treatments. Gram intercropping + 1 manual hoeing produced 4.19, 15.31 and 22.86 per cent higher wheat grain equivalent yield over two manual hoeings, 1 manual hoeing and gram intercropping treatments, respectively. However, weeds in weedy check reduced grain yield to the tune of 53.93 and 52.00 per cent over gram intercropping + one manual hoeing and two manual hoeings, respectively. This can be attributed due to the suppression of weeds by the intercrop and removal of weeds by manual hoeings. Wheat equivalent yield was computed higher under the treatment of wheat + chickpea intercropping than sole wheat. Kaushik *et al*. (2016) [2]. However, these are attributed due to higher economic value of chickpea in gram intercropping + one manual hoeing treatment.

Interaction effect

The interaction (Table 1 and 2) between weed management treatments among same seed bed manipulations was significant for dry matter accumulation of total weeds at 120 days after sowing and wheat equivalent yield. Significantly lowest dry matter accumulation of total weeds was obtained with gram intercropping + one manual hoeing under both seed bed manipulations. Under stale seed bed condition, gram intercropping + one manual hoeing remained statistically at par with two manual hoeings and was followed by statistically similar treatments of gram intercropping and one manual hoeing. Gram intercropping + one manual hoeing produced significantly highest wheat equivalent yield in standard seed bed. In stale seed bed, two manual hoeings being at par with gram intercropping + one manual hoeing produced significantly highest wheat equivalent yield as compared to other treatments.

The interaction between same or different seed bed manipulations and weed management treatments revealed that dry matter accumulation of total weeds was significantly lower with the combination of stale seed bed and gram intercropping + one manual hoeing. Whereas, wheat equivalent yield was significantly higher with the combination of standard seed bed and gram intercropping + one manual hoeing but it remained at par with two manual hoeings under standard seed bed. Among all weed management treatments, standard seed bed recorded higher wheat equivalent yield over stale seed bed.

Table 1: Effect of treatments on total weed dry weight and weed control efficiency

Treatments	Total weed dry weight (g/m^2) 120 DAS	Weed control efficiency (%) 120 DAS
Seed bed manipulations		
Standard seed bed	205.34	51.38
Stale seed bed	151.66	57.71
CD (P=0.05)	13.39	4.91
Weed Management		
One Manual hoeing	144.01	63.44
Two Manual hoeings	114.58	71.07
Gram intercropping(no weeding)	135.98	65.55
Gram intercropping + one manual hoeing	108.17	72.61
Natural farming (Mulching)	188.89	51.74
Natural farming (Gram intercropping + mulching)	167.33	57.42
Weedy check	390.54	-
CD (P=0.05)	6.66	2.27

Table 2: Effect of seed bed manipulations and weed management methods on yield attributes and wheat equivalent yield

Treatments	No. of effective tillers m^{-2}	No. of grains spike^{-1}	1000 grain weight (g)	Wheat equivalent yield (kg ha^{-1})
Seed be manipulations				
Standard seed bed	263.38	49.65	60.15	3160
Stale seed bed	259.90	47.55	59.18	2920
CD (P=0.05)	3.22	NS	NS	107
One Manual hoeing	323.67	51.13	61.46	3430
Two Manual hoeings	332.50	54.13	65.43	3796
Gram intercropping (no weeding)	232.50	48.42	59.17	3219
Gram intercropping + one manual hoeing	252.00	55.49	63.65	3955
Natural farming (Mulching)	241.33	43.41	56.66	2382
Natural farming (Gram intercropping + mulching)	228.83	46.30	57.32	2676
Weedy check	220.67	41.29	53.97	1822
CD (P=0.05)	8.46	2.02	NS	161

Table 3: Interaction effects of seed bed manipulations and weed management methods on dry matter accumulation (g m^{-2}) of total weeds

Weed Management	Dry matter accumulation of total weeds at 120 DAS	
	Standard seed bed	Stale seed bed
One Manual hoeing	171.56	116.46
Two Manual hoeings	143.22	85.94
Gram intercropping (no weeding)	165.38	106.59
Gram intercropping + one manual hoeing	130.76	85.57
Natural farming (Mulching)	210.82	166.96
Natural farming (Gram intercropping + mulching)	193.03	141.63
Weedy check	422.61	358.46
CD (P=0.05)		
To compare weed management methods at same level of seed bed manipulation		9.40
To compare seed bed manipulation at same or different weed management methods		15.27

Table 4: Interaction effects of seed bed manipulations and weed management methods on wheat equivalent yield

Weed Management	Wheat equivalent yield (kg ha^{-1})	
	Standard Seed Bed	Stale Seed Bed
One Manual hoeing	3546	3314
Two Manual hoeings	3830	3762
Gram intercropping (no weeding)	3417	3020
Gram intercropping + one manual hoeing	4219	3690
Natural farming (Mulching)	2451	2313
Natural farming (Gram intercropping + mulching)	2806	2546
Weedy check	1849	1796
CD (P=0.05)		
To compare weed management methods at same level of seed bed manipulations		228
To compare seed bed manipulation at same or different weed management methods		417

Conclusion

Broadleaf weeds constituted 79.7 and 13.6 per cent of total weed population. Wheat equivalent yield was computed higher under the treatment of wheat + chickpea intercropping than sole wheat. Stale seed bed attributed lower weed biomass due to the fact that it produced suitable conditions in the field for germination of weeds that emerged and uprooted during final seed bed preparation, thus minimized weed seed bank in the soil.

References

1. Economou GO, Tzakou A, Gani A, Yannitsaros A, Bilalis D. Allelopathic effect of *Conyza albida* on *Avena sativa* and *Spirodela polyrhiz*. Journal of Agronomy and Crop Science. 2002; 188: 248-253

2. Kaushik SS, Singh DV, Sharma AK, Rati AK, Negi RS. Performance of wheat based intercropping as influenced by row proportions under rainfed conditions of Kaymore plateau. International Journal of Humanities and Social Science Invention. 2016; 5(9):11-14.
3. Mumtaz MZ, Aslam M, Nasrullah HM, Akhtar M, Ali B. Effect of various sowing dates on growth, yield and yield components of different genotypes. American-Eurasian Journal of Agricultural and Environmental Sciences. 2015; 15(11):2230-2234
4. Naeem M, Zahid Ata Cheema ZA, Ahmad AUH, Wahid A, Kamaran M, Arif M. Weed dynamics in wheat-canola intercropping systems. Chilean Journal of Agricultural Research. 2012; 72(3):434-439
5. Nongmaithem D, Pal D, Ghosh PK. Weed control through smothering crops and use of plant extracts as bioherbicides. Indian Journal of Weed Science. 2012; 44(4):251-254.
6. Oad FC, Siddiqui MH, Buriro UA. Growth and yield losses in wheat due to different weed densities. Asian Journal of Plant Sciences. 2007; 6:173-176.
7. Safdar ME, Asif M, Ali A, Aziz M, Yasin M, Afzal M *et al*. Comparative efficacy of different weed management strategies in wheat. Chilean Journal of Agricultural Research. 2011; 71(2):195-204
8. Yadollahi P, Abad ARB, Khaje M, Asgharipour AA, Amiri A. Effect of intercropping on weed control in sustainable agriculture. International Journal of Agriculture and Crop Sciences. 2014; 7(10):683-686
9. Yadav PK, Kurchania SP, Tiwari JP. Herbicide and fertilizer compatibility under normal and stale seed bed sowing of wheat (*Triticum aestivum*) at different levels of nitrogen. Indian Journal of Agricultural Sciences. 1995; 65(4):265-270.