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Influence of rice residue and weed management on weed dynamics in late sown wheat (*Triticum aestivum* L.)

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Abstract
A field experiment was conducted during 2020-21 to 2021-22 at CRC, Chirodi, Sardar Vallabhbhai Patel University of Agriculture and Technology Modipuram Meerut (U.P.). The experiment was laid out in split plot design (SPD) to evaluate the effect of four residue management practices in main plots *viz.* R_1 (Residue Burning), R_2 (Residue Removal), R_3 (Residue treated with PUSA Decomposer) R_4 (Residue treated with Trichoderma) and five weed management option under sub plots; W_1(Weedy) W_2 (Two hand weeding's @ 30 & 45 DAS) W_3 (Sulfosulfuron @ 25 g a.i. ha^{-1}) W_4 (Fenoxaprop-p-ethyl + Metsulfuron methyl @ 100 g + *4g a.i.* ha^{-1}) W_5 (Brown manuring *fb* Chlodinofop @ 60 g *a.i.* ha^{-1}) on weed dynamics at 60 and 90 DAS of late sown wheat (*Triticum aestivum* L.) during *rabi* season. Out of rice residue management, weed suppress with treatment of residue treated with PUSA Decomposer compare to residue removal during both the year. Among the herbicides, brown manuring *fb* Chlodinofop @ 60 g *a.i.* ha^{-1} reduces the narrow and broad leaves weeds very effectively and recorded lowest value of population and dry matter of weeds compare to other herbicide treatments at 60 and 90 DAS during both years. Result shows that the application of rice residue treated with PUSA decomposer along with brown manuring *fb* Chlodinofop @ 60 g *a.i.* ha^{-1} effectively suppresses the total weed flora in wheat crop.

Keywords: Rice residue, *Trichoderma*, Pusa decomposer, weed control, brown manure, herbicides

Introduction
Rice (*Oryza sativa* L.) - Wheat (*Triticum aestivum* L. emend Fiori & Poal) cropping sequence is the most predominant production system occupying about 18 Mha in Asia, of which 13.5 Mha area in Indo-Gangetic Plains (IGP) of India.(An)
Rice residue is an agricultural waste residues, it important natural resources, and recycling of these residues improves the soil physical, chemical and biological properties.
The approximate production of crop residue per annum is 500 million tonnes which is likely to increase. A rice-wheat cropping sequence that yields 7 t ha^{-1} & 4 t ha^{-1} of rice-wheat, removes more than Nitrogen 300, Phosphorus 30 and potash 300 kg ha^{-1} from the soil; the residues of rice and wheat amount to as much as 7-10 t ha^{-1} yr^{-1}. Asian farmers need to manage 5-7 t ha^{-1} of rice residues, wheat straw is mostly used as dry fodder for animals, whereas, paddy straw (residues) becomes surplus in the fields due to high lignin and silica and low protein content, it is harmful for cattle. Intensive cropping system coupled with better irrigation and fertilizer application has provided congenial growing condition for weeds particularly in rice-wheat cropping system where weeds causes yield reduction to the level of 30-80% (Walia and Brar, 2001) [15]. Herbicide use to manage weeds is becoming more and more common among farmers. Because manual weed control is time-consuming, labor-intensive, and expensive due to labor shortages during peak times and high labor costs brought on by agricultural workers moving to industries in search of higher and guaranteed income. Rows of wheat are sown quite closely together. As a result, it was unable to use cultural weed control techniques, and manual weed control became prohibitively expensive. Thus, the use of herbicides became particularly common in wheat crops that were irrigated. Because they are highly powerful and efficient, herbicides have proven to be useful and very successful methods of managing weeds in wheat.

Materials and Methods
At the Crop Research Center Chirodi, Sardar Vallabhbhai Patel University of Agriculture and Technology, Modipuram, Meerut (U.P.), which is situated at a latitude of 29°4° North and a

longitude of 77°41' East and is elevated to a height of 237 meters above mean sea level, a field experiment was carried out. The average annual rainfall is 862 mm, and between 80 and 90 percent of that falls between June and September. During the Rabi seasons of 2020–21 and 2021–2, the maximum and lowest temperatures gradually declined from wheat crop seeding through growth and following rise until harvest time. The soil had a sandy loam texture, had an organic carbon content of 0.48 percent at a pH of 7.8, and had accessible amounts of N, P, and K of 214.1, 12.08, and 180.5 kg ha^{-1}, respectively.

Three replications of the experiment were set up in an SPD, along with two key factors. Rice residue management strategies R_1 (residue burning), R_2 (residue removal), R_3 (residue treated with PUSA Decomposer), and R_4 (residue treated with *Trichoderma*) were the five weed control options. W_1(Weedy) W_2 (Two hand weeding's @ 30 & 45 DAS) W_3 (Sulfosulfuron @ 25 g a.i. ha^{-1}) W_4 (Fenoxaprop-p-ethyl + Metsulfuron methyl @ 100 g + 4g *a.i.* ha^{-1}) W_5 (Brown manuring with. fb Chlodinofop @ 60 g a.i. ha^{-1}) crop sowing during first week of December of both years, variety DBW 173 was sowed 20 cm apart using 125 kg of seed ha^{-1}. Fertilizer were applied as per treatment through urea, diammonium phosphate, and muriate of potash, with a one third dose of nitrogen and a full dose of potassium and phosphorus as top dressing of urea after first irrigation and panicle initiations stages. To prevent any form of water stress, the crop was irrigated more than twice, 20 to 25 days apart following the initial irrigation at the crown root stage. Herbicides were administered post-emergence, or 30 DAS, using a hand-operated knapsack sprayer with a flat fan nozzle and 250 liters of water per hectare. At 30 and 45 DAS, the first hand weeding was completed. Weed density and dry weight were measured at 60 DAS. Before statistical analysis, the recorded data on weed density and dry weight were square root transformed. The weed control efficiency will be calculated at maximum growth stage i.e. 60th day stage by from the weed dry weight, calculated by using the following formula.

$$WCE = \frac{W1 - W2}{W1} x\,100$$

Where,
W1 = Weed dry weight of unweeded plot (g m^{-2})
W2 = Weed dry weight of treated plot (g m^{-2})

Results and Discussion

The weed flora in the experimental field were collected, identified and classified at different stages of crop growth. Predominant weed species among broad leaf weeds given table no. 1

Table 1: Major weed flora of experimental field during wheat crop season

Botanical Name	English Name	Common Name	Family
(A) Narrow leaf			
Phalaris minor	Little seed canary-grass	Gulli-danda	Poaceae
Avena ludoviciana	Wild oat	Jangli Jai	Poaceae
Cynodon dactylon	Bermuda grass	Doob grass	Poaceae
(B) Broad Leaf			
Anagallis arvensis	Blue or Scarlet pimpernel	Krishneel	Primulaceae
Chenopodium album	Common lambs quarters	Bathua	Chenopodiaceae
Rumex dentatus	toothed dock	Jangli Palak	Polygonaceae
Fumaria parviflora	Fumitory	Gajri	Fumariaceae
(C) Sedges			
Cyperus rotundus	Purple nut sedge	Motha	Cyperaceae

Moreover, among sedges only one species i.e. *Cyperus rotundus* was observed. Malik *et al.* (2012) [9] reported similar weed flora in wheat crop under normal sown condition. Also reported (Singh *et al*., 2006.) [13] that major weed in wheat crop of Gonda district of eastern Uttar Pradesh, India is *Avena fatua, Asphodelus tenuifolius, Cynodon dactylon, Cyperus rotundus, Phalaris minor, Chenopodium album, Anagallis arvensis, Melilotus alba, Melilotus indica, Vicia hirsuta, Vicia sativa, Lathyrus aphaca, Solanum xanthocarpum* and *Euphorbia hirta*.

Population and dry matter accumulation of total weeds differ significantly with rice residue and weed management option during both the years at 60 and 90 DAS. Data presented in Table no. 2 and 3 indicated that population and dry matter accumulation of total weeds declined with advancement of crop growth stages during both the years. It has been observed the highest population and dry matter accumulation of total weeds was recorded with Residue Removal at 60 and 90 DAS followed by R_4-Residue treated with *Trichoderma (*RTT) and R_1-Residue Burning (RB) respectively during both the year. Data also reveal that significantly lower weed population and dry matter accumulation with the treatment Residue treated with PUSA Decomposer at 60 and 90 DAS during 2020-21 and 2021-22 respectively. Similarly result found (Brar and Walia, 2008) [1]. Wheat and rice residue have been identified as exhibiting genetically controlled allelopathy which could be exploited for weed control (Wu *et al*., 2001; Khanh *et al.*, 2007) [17, 6]. Crop residues provide physical barriers that can prevent both light penetration and seedling emergence. The reduction in available light under surface residue has significant effects on seedling growth; as germinated seeds search for light they exhaust energy reserves and become etiolated, weak, and more susceptible to certain types of herbicide damage (Crutchfield *et al*., 1986) [3]. Crop residues can indirectly reduce weed seed production by limiting weed growth (via light interception, physical barriers, and allelopathy)-smaller weed plants result in lower weed seed production, as the two have a strong linear relationship (Wilson *et al*., 1995; Franke *et al*., 2007) [16, 4]. Crop residues suppressed the growth of all weed species in maximum level (Sarker *et al*., 2020) [12]. 26% and 44% respondents observed low infestation of *P. minor* in fields where rice straw incorporation was done with harrow and mould board plough, respectively. Residue incorporation reduced weed density, especially of *Phalaris minor*, resulting highest wheat yield during 2nd and 3rd year (Khankhane *et al.*, 2009) [7]. The results indicated that weed plants greatly declined regardless of type of weed species, when the plant residues were incorporated into the soil (Tehrani Maryam *et al.*, 2009) [14].

Among the weed management practices two hand weeding was most effective against reducing the total population (no. m^{-2}) of weeds and dry matter accumulation (m^{-2}) than other treatments irrespective of years. The highest total population (no. m^{-2}) dry matter accumulation of total weeds were recorded under weedy treatment at 60 and 90 DAS, respectively, during 2020-21 & 2021-22. Moreover, all herbicide treatment recorded significantly lowest recorded total population (no. m^{-2}) and dry matter accumulation (m^{-2}) in treatment Brown manuring fb chlodinofop @ 60 g *a.i.* ha^{-1} which was at par with Fenoxaprop-p-ethyl + Metsulfuron methyl @ 100 g + 4g a.i. ha^{-1} at 60 and 90 DAS during both the year respectively. Weed control efficiency was recorded at 60 DAS highest found in the treatment Brown manuring fb chlodinofop @ 60 g *a.i.* ha^{-1} Likewise, dry weight of the broad-leaved weeds, narrow leaved weeds, and sedges was reduced by 75 per cent, 65 per cent, and 62 per cent (Iliger *et al.*, 2017) [5]. Use of dhaincha brown manure (Prabhakaran and Chinnusamy, 2006) [10] was found effective in reducing density and dry matter accumulation of weeds. Ramachandran *et al.* (2012) [11] revealed that brown manuring helped in suppressing the weeds up to 50% of total weed population on the account of the shade effect of killed manure crop till 45 days after sowing which is considered as the critical period of crop weed competition in *rabi* maize.

Table 2: Population of total weeds (number m^{-2}) at 60 DAS as influenced by rice residue and weeds management practices

Treatment	Population(number m^{-2})			
	60 Das		90DAS	
	2020-21	2021-22	2020-21	2021-22
Rice residue management				
R_1-Residue Burning (RB)	6.11 (47.84)	6.84 (55.68)	5.30 (37.55)	6.25 (47.71)
R_2-Residue Removal (RR)	6.64 (56.00)	7.33 (64.16)	5.75 (43.90)	6.67 (53.30)
R_3-Residue treated with PUSA Decomposer (RTD)	5.90 (45.44)	6.51 (51.17)	5.19 (36.44)	6.00 (43.47)
R_4-Residue treated with Trichoderma (RTT)	5.10 (47.95)	6.67 (54.08)	5.28 (37.52)	6.16 (44.567)
S.Em±	0.03	0.04	0.09	0.04
C.D.(P=0.05)	0.11	0.15	0.31	0.15
Weed management				
W_1-Weedy	13.02 (168.33)	13.09 (170.67)	11.89 (140.40)	12.02 (143.66)
W_2-Two hand weeding's @ 30 & 45 DAS	3.66 (12.47)	3.85 (13.66)	3.10 (8.63)	4.26 (17.19)
W_3-Sulfosulfuron (@ 25 g *a.i.* ha^{-1}	5.32 (27.52)	6.21 (37.76)	4.51 (19.47)	5.43(28.52)
W_4-Fenoxaprop-p-ethyl + Metsulfuron methyl @ 100 g + 4g *a.i.* ha^{-1}	4.72 (21.35)	5.72 (31.84)	3.94 (14.60)	4.98 (23.84)
W_5-Brown manuring with. fb Chlodinofop @ 60 g *a.i.* ha^{-1}	4.22 (16.87)	5.30 (27.14)	3.47 (11.16)	4.66 (20.72)
S.Em±	0.04	0.06	0.05	0.04
C.D.(P=0.05)	0.12	0.16	0.13	0.10

Data subjected to square root ($\sqrt{x+1}$) transformation and original values is given in parentheses

Table 3: Dry matter accumulation of total weeds (dry matter m^{-2}) at 60 and 90 DAS and weed control efficiency (%) at 60 DAS influenced by rice residue and weeds management practices

Treatment	Dry matter accumulation (m^{-2})				Weed control efficiency (%) at 60 DAS	
	60 Das		90DAS			
	2020-21	2021-22	2020-21	2021-22	2020-21	2021-22
Rice residue management						
R_1-Residue Burning (RB)	5.50 (40.76)	5.84 (44.34)	6.40 (55.80)	6.74 (59.18)	-	-
R_2-Residue Removal (RR)	5.93 (47.62)	6.30 (51.85)	6.87 (62.82)	7.19 (67.74)	-	-
R_3-Residue treated with PUSA Decomposer (RTD)	5.18 (37.05)	5.569 (42.26)	6.16 (52.26)	6.51 (57.09)	-	-
R_4-Residue treated with Trichoderma (RTT)	5.39 (38.33)	5.81 (44.17)	6.41 (55.86)	6.68 (59.27)	-	-
Sem±	0.026	0.038	0.050	0.059	-	-
C.D.(P=0.05)	0.092	0.135	0.177	0.207	-	-
Weed management						
W_1-Weedy	11.96 (142.35)	12.16 (147.02)	14.00 (194.97)	14.06 (197.05)	0.00	0.00
W_2-Two hand weeding's @ 30 & 45 DAS	1.70 (1.87)	1.76 (2.10)	2.23 (3.96)	2.17 (4.05)	98.67	98.58
W_3-Sulfosulfuron (@ 25 g *a.i.* ha^{-1}	5.20 (26.15)	5.66 (31.11)	6.06 (35.89)	6.40 (40.41)	81.62	78.81
W_4-Fenoxaprop-p-ethyl + Metsulfuron methyl @ 100 g + 4g *a.i.* ha^{-1}	4.59 (20.10)	5.20 (26.10)	5.34 (27.57)	5.89 (34.00)	85.86	82.23
W_5-Brown manuring with. fb Chlodinofop @ 60 g *a.i.* ha^{-1}	4.05 (15.46)	4.79 (21.94)	4.68 (21.03)	5.40 (28.59)	89.13	85.04
S.Em±	0.043	0.041	0.038	0.038	-	-
C.D.(P=0.05)	0.125	0.118	0.111	0.110	-	-

Data subjected to square root ($\sqrt{x+1}$) transformation and original values is given in parentheses.

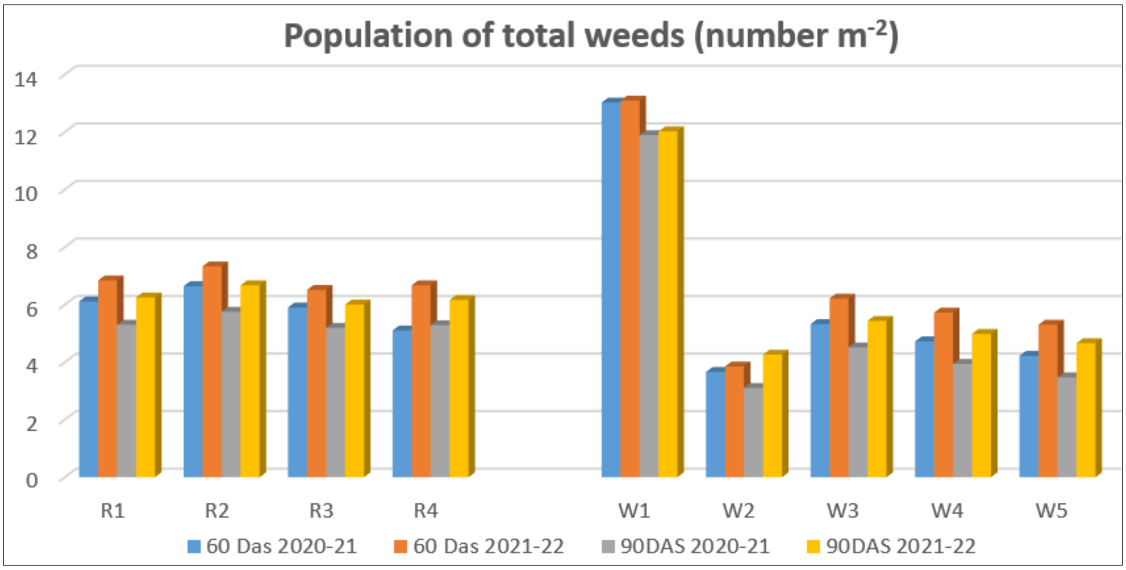

Fig 1: Population of total weeds (number m^{-2}) at 60 and 90 DAS as influenced by rice residue and weeds management practices

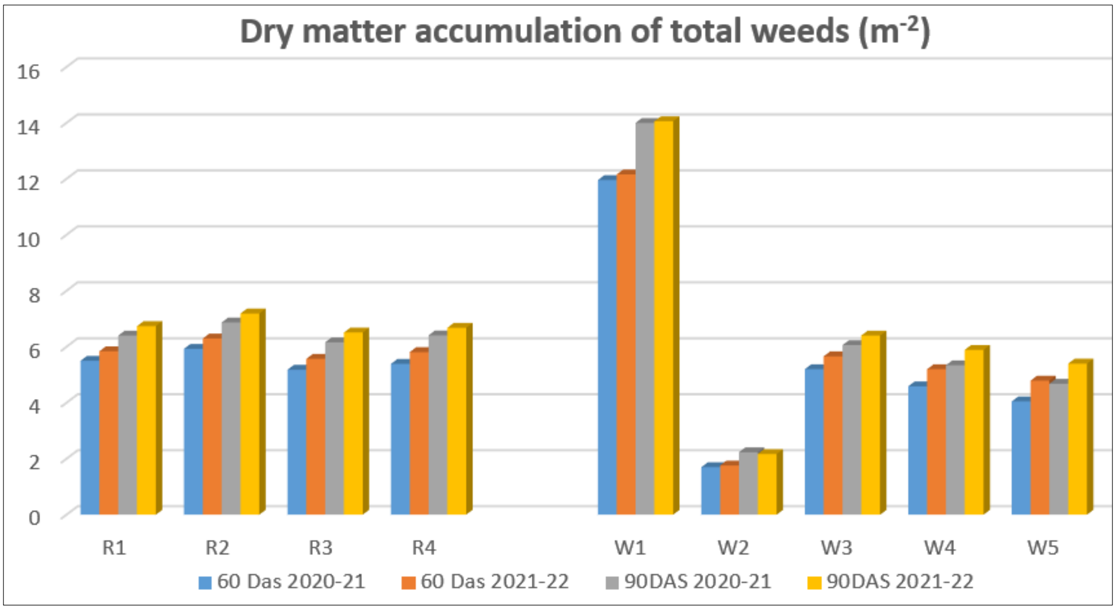

Fig 2: Dry matter accumulation of total weeds (m^{-2}) at 60 and 90 DAS as influenced by rice residue and weeds management practices

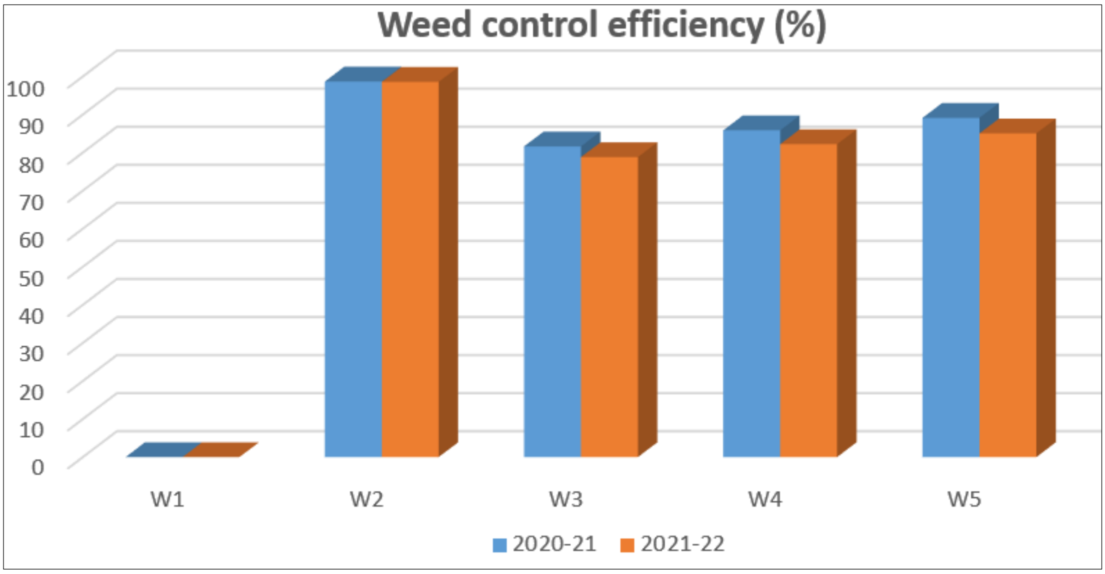

Fig 3: Weed control efficiency (%) of total weeds at 60 DAS as influenced by management practices

Conclusion

Thus, this experiment concluded that to get the maximum weed control efficiency and to suppress total weed population as well as total dry matter of weeds the application of rice residue treated with PUSA decomposer along with brown manuring *fb* Chlodinofop @ 60 g *a.i.* ha^{-1} founds vary effective.

Reference

1. Brar AS, Walia US. Effect of rice residue management techniques and herbicides on nutrient uptake by Phalaris minor Retz. and wheat (*Triticum aestivum* L.). Indian Journal of Weed Science. 2008;40(3&4):121-127.
2. Buttar GS, Kaur S, Kumar R, Singh D. Phalaris minor Retz. Infestation in wheat crop as influenced by different rice straw management practices usage in Punjab, India Indian Journal of Weed Science. 2022;54(1):31-35.
3. Crutchfield DA, Wicks GA, Burnside OC. Effect of winter wheat (*Triticum aestivum*) straw mulch level on weed control. Weed Sci. 1986;34:110-114.
4. Franke A, Singh S, McRoberts N, Nehra A, Godara S, Malik R, *et al*. Phalaris minor seed bank studies: longevity, seedling emergence and seed production as affected by tillage regime. Weed Res. 2007;47:73-83.
5. Iliger MD, Sutar R, Chogatapur SV, Reddy RP. Effect of Brown Manuring on Soil Properties, Weed Density, Grain Yield and Economics of Different Crops. Advances in Research. 2017;12(6):1-11.
6. Khanh T, Xuan T, Chung I. Rice allelopathy and the possibility for weed management. Ann. Appl. Biol. 2007;151:325-339.
7. Khankhane PJ, Barman KK, Varshney JG. Effect of rice residue management practices on weed density, wheat productivity and soil fertility in a swell-shrink soil Indian Journal of Weed Science. 2009;41(1&2):41-45.
8. Kumar R, Singh UP, Mahajan G. Performance of Zero-till Wheat (*Triticum aestivum* L.) and Weed Species as Influenced by Residue and Weed Management Techniques in Rice based Cropping System. International Journal of Current Microbiology and Applied Sciences. 2017;8(4):270-277.
9. Malik RS, Yadav A, Kumar R, Hasija RC, Hooda VS. Performace of different herbicides for the control of complex weed flora in wheat. Environment and Ecology. 2012;30(3A):717-721.
10. Prabhakaran NK, Chinnusamy C. Integration of seeding methods and weed control practices in wet seeded rice. National Symposium on Conservation Agriculture and Environment, October 26-28, at BHU, Varanasi, India. 2006, 318-19.
11. Ramachandran A, Veeramani A, Prema P. Effect of brown manuring on weed growth, yield and economics of irrigated maize. Indian Journal of Weed Science. 2012;44(3):204-206.
12. Sarker UP, Uddin MR, Faruk GD. Weed suppressing ability and performance of common crop residues for sustainable weed management Journal of Research in Weed Science. 2020;3(3):10-327.
13. Singh RS, Sharma SN, Singh RK, Pandey MD. Effect of different tillage system on the performance of wheat. In: Proc. int. work shop on herbicides resistance management and zero tillage in rice-wheat cropping system held at CCSHAU, Hisar, India. 2006 Sept 4-6, 115-113.
14. Tehrani M, Ayenehband A, Nabati AD. The study f dynamics of weed plants population affected by residue management and nitrogen splitting implanting of canola (*Brassica napus* L.). The plant production (Scientific journal of agriculture. 2009;32(1):65-79.
15. Walia US, Brar LS. Competitive ability of wild oats (*Avena ludoviciana* Dur.) and broad-leaf weeds with wheat in relation to crop density and nitrogen levels. Indian Journal of Weed Science. 2001;33:120-123.
16. Wilson B, Wright K, Brain P, Clements M, Stephens E. Predicting the competitive effects of weed and crop density on weed biomass, weed seed production and crop yield in wheat. Weed Res. 1995;35:265-278.
17. Wu H, Pratley J, Lemerle D, Haig T. Allelopathy in wheat (*Triticum aestivum*). Ann. Appl. Biol, 2001, 139, 1-9.