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Effect of weed management practices and organic sources of nitrogen supplementation on weed density and yield of wheat

***Bhupesh Kumar Mishra and Santosh Pandey**

Institute of Agricultural Sciences,
Bundelkhand University, JHANSI-284128 (UP)
*Corresponding Author
E-mail:mbhupesh14@gmail.com

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ABSTRACT

The different weed control methods (two hand weeding at 25 and 45 days after sowing (DAS) and one hand weeding at 25 DAS along with unweeded control), organic sources of nitrogen (vermicompost, poultry manure, city manure and FYM) and their interaction were compared for their efficiency on various weed species and yield of wheat. Two hand weeding (W_2) gave significantly maximum weed control. This was followed by one hand weeding at 25 DAS and control. These weed control methods significantly enhanced the yield and yield components of wheat. Among organic sources of nitrogen vermicompost (M_1) recorded minimum weed density, weed dry weight and maximum yield, followed by poultry manure, city manure and FYM.

Figure : 00 References : 08 Tables : 04
KEY WORDS : Density, Interaction, Supplementation, Vermicompost.

Introduction

Wheat (*Triticum aestivum*) is the world's most widely cultivated food crop; it confirms food security in 94 countries. It is cultivated in about 220 million hectares area in the world. Uttar Pradesh has major share of total food grain production of 51.25 m t with an area of 19.83 m ha, which makes it the major producer state and shares highest wheat grain production 31.88 m t, followed by Punjab (17.85 m t), and M.P (15.96 m t). Uttar Pradesh shares 31.98% of total wheat production while Punjab and M. P. share 17.90% and 15.96% respectively[1]. Wheat competes well with weeds especially when grown with good production techniques. Effective weed control in preceding crops reduces the risk of weed problem in wheat. A healthy, vigorous wheat stand is extremely competitive with weeds and is the single most important component of weed control strategy. Suitable cultivation practices, timely sowing, seed rate and fertilization *etc.* ensure proper plant stand and vigorous growth *vis-à-vis* yield and reduces weed population.

Materials and Methods

The present investigation was conducted in Rabi season of 2017-18 and 2018-19 at the Organic Research Farm, Karguanji, Bundelkhand University, Jhansi, Uttar Pradesh. The experiment was laid out in factorial randomized block design with three replications. Treatments were two methods of weeding along with weedy check and four organic sources of Nitrogen *viz:,* vermicompost, poultry manure, city manure and FYM. The recommended dose of nitrogen of N_{100} was common in all the treatments. The twelve treatment combinations were allotted in each plot. Wheat variety RAJ-4037 was sown. The recommended dose of fertilizers ($N_{120}P_{60}K_{40}$) were applied on the nitrogen requirement basis through vermicompost, poultry manure, city manure and FYM before sowing.

Results

Weed density

The density of the different weed species and other weeds as well as total weed density were recorded at 20, 40, 60 DAS and at harvest stages of crop growth. Specieswise weed density during both the years as influenced by various treatments have been presented (Tables-1, 2, 3 and 4). The density of the individual weed species and other weeds as well as total weeds was affected significantly due to different organic sources of

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TABLE-1: Effect of weed control method and nitrogen supplementation through organic sources on weed intensity at 20 days after sowing

Organic source of nitrogen	Weed intensity (2017-18)						Weed intensity (2018-19)					
	P. *minor*	A. *arvensis*	*Avana spp*	C. *album*	Other weeds	Total weeds	P. *minor*	A. *arvensis*	*Avana spp*	C. *album*	Other weeds	Total weeds
M_1	5.38 (28.50)	4.35 (18.50)	3.57 (12.30)	3.12 (9.27)	3.99 (15.47)	9.18 (84.03)	5.20 (26.63)	4.28 (17.80)	3.44 (11.37)	3.01 (8.60)	3.86 (14.43)	8.90 (78.90)
M_2	5.57 (30.60)	4.58 (20.53)	3.84 (14.27)	3.48 (11.63)	4.30 (18.07)	9.77 (95.10)	5.38 (28.47)	4.50 (19.80)	3.73 (13.43)	3.37 (10.87)	4.16 (16.87)	9.47 (89.43)
M_3	6.68 (44.23)	5.82 (33.43)	4.57 (20.43)	4.26 (17.70)	4.97 (24.30)	11.84 (140.10)	6.43 (41.00)	5.69 (31.97)	4.39 (18.87)	4.09 (16.23)	4.76 (22.20)	11.42 (130.27)
M_4	6.36 (40.07)	5.37 (28.43)	4.36 (18.53)	4.03 (15.80)	4.65 (21.23)	11.15 (124.07)	6.15 (37.37)	5.35 (28.27)	4.24 (17.50)	3.89 (14.67)	4.58 (22.50)	10.89 (118.30)
SE(m)±	0.118	0.103	0.081	0.072	0.090	0.214	0.119	0.098	0.080	0.070	0.087	0.198
CD (p=0.05)	0.346	0.302	0.238	0.211	0.265	0.626	0.349	0.288	0.234	0.204	0.256	0.580
Weed Control Method												
W_0	6.02 (36.03)	4.94 (24.30)	4.10 (16.50)	3.71 (13.48)	4.54 (20.28)	10.48 (110.58)	5.78 (33.23)	4.90 (23.83)	3.94 (15.20)	3.54 (12.18)	4.36 (18.65)	10.13 (103.08)
W_1	5.93 (35.08)	5.19 (26.88)	4.06 (16.20)	3.71 (13.50)	4.47 (19.68)	10.51 (111.33)	5.76 (33.08)	5.13 (26.28)	3.99 (15.65)	3.64 (12.98)	4.36 (18.65)	10.28 (106.63)
W_2	6.04 (36.45)	4.96 (24.50)	4.09 (16.45)	3.75 (13.83)	4.43 (19.35)	10.47 (110.58)	5.83 (33.80)	4.84 (23.33)	3.91 (15.03)	3.59 (12.63)	4.30 (18.20)	10.11 (102.98)
SE(m)±	0.102	0.089	0.070	0.062	0.078	0.185	0.103	0.085	0.069	0.060	0.076	0.171
CD (p=0.05)	0.300	0.262	0.206	0.183	0.230	0.542	0.302	0.250	0.203	0.177	0.222	0.502

Square root transformation (“X+0.05) was applied for analysis. Figures in parenthesis are original value

TABLE-2: Effect of weed control method and nitrogen supplementation through organic sources on weed intensity at 40 days after sowing

Organic source of nitrogen	Weed intensity (2017-18)						Weed intensity (2018-19)					
	P. *minor*	A. *arvensis*	*Avana spp*	C. *album*	Other weeds	Total weeds	P. *minor*	A. *arvensis*	*Avana spp*	C. *album*	Other weeds	Total weeds
M_1	4.87 (24.13)	4.01 (16.03)	3.17 (10.00)	2.78 (7.57)	3.60 (13.07)	8.27 (70.80)	4.72 (22.60)	3.93 (15.47)	3.10 (9.53)	2.67 (6.97)	3.60 (12.90)	8.09 (67.47)
M_2	5.01 (25.50)	4.22 (17.77)	3.43 (11.70)	3.10 (9.43)	3.88 (15.13)	8.79 (79.53)	4.86 (24.00)	4.12 (16.97)	3.33 (11.03)	2.97 (8.67)	3.75 (14.07)	8.53 (74.73)
M_3	6.01 (36.80)	5.28 (28.10)	4.02 (16.20)	3.68 (13.53)	4.40 (19.60)	10.53 (114.23)	5.79 (34.20)	5.22 (27.40)	3.88 (15.10)	3.57 (12.70)	4.27 (18.37)	10.24 (107.77)
M_4	5.74 (33.60)	5.00 (25.20)	3.82 (14.70)	3.59 (12.98)	4.28 (18.50)	10.09 (104.08)	5.54 (31.33)	4.91 (24.27)	3.78 (14.33)	3.44 (11.73)	4.13 (17.13)	9.80 (98.80)
SE(m)±	0.104	0.095	0.072	0.061	0.082	0.195	0.110	0.094	0.067	0.060	0.029	0.045
CD (p=0.05)	0.305	0.279	0.212	0.180	0.241	0.572	0.322	0.277	0.196	0.177	0.086	0.131
Weed control method												
W_0	6.81 (48.26)	5.66 (32.03)	4.59 (20.80)	4.14 (16.88)	5.13 (26.00)	11.87 (141.98)	6.58 (43.23)	5.57 (30.98)	4.48 (19.73)	4.02 (15.85)	4.96 (24.23)	11.55 (134.00)
W_1	4.76 (22.38)	4.15 (17.00)	3.15 (9.55)	2.89 (7.98)	3.53 (12.10)	8.28 (69.00)	4.60 (20.90)	4.07 (16.38)	3.08 (9.08)	2.76 (7.23)	3.44 (11.40)	8.05 (64.98)
W_2	4.65 (21.38)	4.07 (16.30)	3.08 (9.10)	2.83 (7.65)	3.47 (11.63)	8.11 (66.05)	4.50 (19.98)	3.99 (15.73)	3.02 (8.70)	2.71 (6.98)	3.41 (11.22)	7.90 (62.60)
SE(m)±	0.090	0.082	0.063	0.053	0.071	0.169	0.095	0.082	0.058	0.052	0.025	0.039
CD (p=0.05)	0.264	0.241	0.184	0.156	0.209	0.496	0.279	0.240	0.170	0.153	0.074	0.113

Square root transformation (“X+0.05) was applied for analysis. Figures in parenthesis are original value

TABLE-3: Effect of weed control method and nitrogen supplementation through organic sources on weed intensity at 60 days after sowing

Organic source of nitrogen	Weed intensity (2017-18)						Weed intensity (2018-19)					
	P. *minor*	A. *arvensis*	*Avana spp*	C. *album*	Other weeds	Total weeds	P. *minor*	A. *arvensis*	*Avana spp*	C. *album*	Other weeds	Total weeds
M_1	4.97 (26.60)	4.12 (17.73)	3.26 (11.17)	2.86 (8.43)	3.71 (14.60)	8.48 (78.53)	4.83 (24.97)	4.04 (17.07)	3.19 (10.63)	2.75 (7.80)	3.70 (14.33)	8.29 (74.80)
M_2	5.10 (28.00)	4.31 (19.43)	3.50 (12.87)	3.14 (10.23)	3.99 (16.83)	8.98 (87.37)	5.05 (27.03)	4.24 (18.73)	3.43 (12.27)	3.05 (9.63)	3.85 (15.63)	8.79 (83.30)
M_3	6.14 (40.49)	5.38 (30.63)	4.18 (18.24)	3.83 (15.30)	4.55 (21.92)	10.83 (126.58)	6.02 (38.53)	5.43 (30.73)	4.14 (17.77)	3.82 (15.00)	4.43 (20.67)	10.73 (122.70)
M_4	5.87 (37.00)	5.12 (27.66)	3.91 (16.35)	3.68 (14.15)	4.40 (20.52)	10.33 (115.69)	4.86 (23.70)	4.91 (25.63)	3.76 (15.07)	3.45 (12.53)	4.12 (18.20)	9.43 (95.13)
SE(m)±	0.107	0.100	0.071	0.070	0.085	0.200	0.068	0.064	0.050	0.067	0.085	0.187
CD (p=0.05)	0.315	0.293	0.208	0.206	0.250	0.585	0.199	0.189	0.146	0.197	0.250	0.547
Weed control method												
W_0	7.76 (60.20)	6.44 (41.60)	5.23 (27.05)	4.71 (21.98)	5.84 (33.83)	13.54 (184.65)	6.95 (48.68)	6.34 (40.28)	5.09 (25.63)	4.56 (20.55)	5.64 (31.55)	12.87 (166.68)
W_1	4.99 (24.67)	4.35) (18.70	3.28 (10.42)	2.99 (8.59)	3.70 (13.31)	8.67 (75.68)	4.82 (22.90)	4.21 (17.50)	3.16 (9.58)	2.86 (7.80)	3.53 (12.03)	8.33 (69.80)
W_2	3.81 (14.20)	3.41 (11.30)	2.63 (6.50)	2.43 (5.53)	2.95 (8.28)	6.76 (45.80)	3.80 (14.10)	3.41 (11.35)	2.64 (6.60)	2.39 (5.38)	2.91 (8.05)	6.72 (45.48)
SE(m)±	0.093	0.086	0.061	0.061	0.074	0.173	0.059	0.056	0.043	0.058	0.074	0.162
CD (p=0.05)	0.273	0.253	0.180	0.179	0.217	0.507	0.173	0.164	0.126	0.171	0.216	0.474

Square root transformation (“X+0.05) was applied for analysis. Figures in parenthesis are original value

TABLE-4: Effect of weed control method and nitrogen supplementation through organic sources on weed intensity at harvest stage

Organic source of nitrogen	Weed intensity (2017-18)						Weed intensity (2018-19)					
	P. *minor*	A. *arvensis*	*Avana spp*	C. *album*	Other weeds	Total weeds	P. *minor*	A. *arvensis*	*Avana spp*	C. *album*	Other weeds	Total weeds
M_1	4.83 (25.10)	3.90 (16.23)	3.17 (10.73)	2.78 (8.17)	3.99 (13.63)	9.18 (73.87)	4.64 (23.07)	3.81 (15.40)	3.02 (9.53)	2.60 (6.97)	3.41 (12.33)	7.84 (67.30)
M_2	4.96 (26.40)	4.09 (17.93)	3.50 (12.63)	3.19 (10.50)	4.30 (16.23)	9.77 (83.70)	4.84 (24.87)	4.06 (17.23)	3.37 (11.68)	3.02 (9.23)	3.69 (14.40)	8.47 (77.42)
M_3	6.08 (39.23)	5.34 (30.10)	4.19 (18.27)	3.96 (16.07)	4.97 (21.80)	11.84 (125.47)	5.91 (36.73)	5.21 (28.50)	4.04 (16.70)	3.76 (14.30)	4.37 (19.77)	10.47 (116.00)
M_4	5.77 (35.53)	4.96 (26.03)	3.96 (16.40)	3.61 (13.50)	4.65 (19.53)	11.15 (111.00)	5.58 (32.90)	4.88 (24.90)	3.84 (15.20)	3.62 (13.23)	4.24 (18.63)	9.93 (104.87)
SE(m)±	0.115	0.095	0.074	0.071	0.090	0.214	0.112	0.089	0.072	0.061	0.083	0.192
CD (p=0.05)	0.337	0.279	0.217	0.208	0.265	0.626	0.327	0.262	0.210	0.178	0.244	0.564
Weed control method												
W_0	7.42 (55.10)	6.24 (38.93)	5.11 (25.85)	4.66 (21.48)	4.54 (31.68)	10.48 (173.03)	7.11 (50.58)	6.02 (36.25)	4.83 (23.06)	4.33 (18.53)	5.35 (28.35)	12.47 (156.76)
W_1	5.19 (26.75)	4.48 (20.03)	3.37 (11.10)	3.02 (8.83)	4.47 (14.05)	10.51 (80.75)	5.00 (24.83)	4.39 (19.15)	3.25 (10.18)	2.98 (8.63)	3.67 (13.13)	8.67 (75.90)
W_2	3.62 (12.85)	3.00 (8.78)	2.63 (6.58)	2.48 (5.88)	4.43 (7.68)	10.47 (41.75)	3.61 (12.78)	3.06 (9.13)	2.62 (6.60)	2.44 (5.65)	2.77 (7.38)	6.39 (41.53)
SE(m)±	0.100	0.082	0.064	0.061	0.078	0.185	0.097	0.077	0.062	0.052	0.072	0.167
CD (p=0.05)	0.292	0.242	0.188	0.180	0.230	0.542	0.283	0.227	0.182	0.154	0.211	0.489

Square root transformation (“X+0.05) was applied for analysis. Figures in parenthesis are original value

nitrogen. At 20 days stage, different weed species were least under application of vermicompost, followed by poultry manure, city manure and FYM. However, city manure recorded statistically similar weed density of grassy, BLWs and sedges to FYM treatment.

Among the organic sources, lower weed density was recorded under vermicompost which was at par with poultry manure and proved significantly superior over city manure and FYM sources of nitrogen. The lower weed density was recorded at 40 days stage of crop growth due to various weed management practices over weedy check. Manual weeding twice (25 & 50 DAS) was at par with single manual weeding at 25 DAS (Table-2).

The organic sources of nitrogen and weed control methods influenced the weed density significantly at 60 DAS (Table-3). Nitrogen through vermicompost was at par with poultry manure and recorded significantly lower weed density over city manure and FYM. The similar type of results were recorded during both the years[2].

Two hand weedings recorded lower weed density, followed by one hand weeding at 25 DAS and weedy check in all the individual weed species as well as total weed density.

The data indicate (Table-4) that weed density reduced significantly due to different sources of nitrogen at harvest stage of crop. Application of vermicompost was at par with poultry manure and recorded significantly lower weed density over city manure and FYM in case of all types of individual weeds and total weed density. Weed density was influenced due to weed management practices. Manual weeding twice recorded significantly lower density of all type of weeds over one hand weeding. The presence of more weeds under FYM and city manure treated plots may be due to grazing of weeds by animals and use of heavy amount of these manures which improved the texture of soil and provided better environment to grow weeds. On the other hand, two hand weedings recorded least weed population as compared to one hand weeding and control. It might may be due to effective weed management by two hand weedings. Weeds have been reported to reduce yields by 10-50 percent[6]. These findings are in close conformity with the results found that the major weed flora dominated with grassy weeds and broad leaf weeds[3, 4]. Wheat crop was seen to be infested with predominated broad-leaf weeds [7, 8]. In wheat crop broad leaf weeds (69.28%) and grassy weeds (30.73%) were the major weeds[5].

Seed yield

The grain yield of wheat was enhanced significantly due to different organic sources of nitrogen supplementation as well as various weed management practices (Table-5). Application of N through vermicompost recorded significantly higher grain yield of wheat over poultry manure and other organic sources. Impact of poultry manure was also superior to city manure and FYM for grain yield of wheat. While, difference in the yield recorded under city manure and FYM treated plots was at par. However, weedy check treatment recorded significantly lowest values of grain yield. Interaction between establishment methods and weed management practices found significant with respect to grain yield.

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