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Soil Major (N, P, K) and Micro (Cu, Mn, Zn and Fe) Nutrients as Influenced by Different Herbicides in Presence of Fertilizer (NPK) in Field Condition of Aligarh Soil under Wheat Cultivation

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Abstract

The present study investigated the effect of different herbicide named pendimethalin, 2,4-D, clodinafop, metsulfuron methyl and metribuzin while applying in combination with uniform dose of inorganic fertilizer (NPK) on soil N, P, K, Cu, Mn, Zn and Fe nutrients in field experiment on Aligarh soil growing wheat as test crop over a period of 120 days. The study revealed that with high concentration of all the herbicides all the macro as well as micro nutrients decreased. The medium and low herbicide concentrations of all the herbicides proved beneficial for increasing the soil N, P, K and Cu, Mn, Zn, Fe as compared to control. On the other hand use of inorganic fertilizer also may have enhanced these nutrients in soil as these nutrients play a vital role in growth and development of a plant. In this field experiment the use of pendimethalin @1000 gai. proved best for both type of soil nutrients , which may have exerted a positive effect on wheat yield as compared to other herbicides as noticed at harvesting. Metribuzin @ 250 gai. proved least effective herbicide for these macro and micro nutrients and also from the point of view of wheat growth and yield.

Keywords: Pendimethalin, metribuzin, macro, micro nutrients and NPK.

Introduction

In the present agro-ecosystem to control weeds use of herbicides is considered to be an efficient and economic tool. While on the other hand use of inorganic fertilizers to obtain the high yield of crops is also in trend. But this may have significant implications for productivity of soil, sustainability of agriculture. As it has been estimated that only 0.1 % of applied pesticide reached the target and the remaining 99.9 % affects the environment[1]. Metribuzin, Pendimethalin, 2,4-D, clodinafop, glyphosate and metsulfuron methyl are some of pre and post-emergent soil applied herbicide to control weeds and to gain high yield in wheat[2]. Although the herbicide may have a beneficial impact on the agricultural productivity, but, environmental hazards of these chemicals are also of much concern because these chemical compounds like herbicides etc. are largely responsible for affecting the soil microorganisms and enzymes, which are responsible for oxidization, mineralization, reduction, immobilization and turnover of nutrients and other organic compounds in soil[3,4] which are finally responsible for soil fertility and growth, development of plant. NPK are essential nutrients which are required in large quantity for various plant physiological processes and growth. Micronutrients are defined as elements which are essential in small quantity. They play critical roles in the biological process of organisms[5]. Environmental and soil concern have prompted the agricultural research to look for improved management strategies. However there is lack of information regarding such work in field conditions.

Materials and Method

The soil used in the investigation was collected from the adjacent district of U.P. (Aligarh). Field study was performed in 5 m^2 plots located at agricultural farm Bhujpura (Aligarh). The soil of study was sandy loam in nature. The soil had the pH- 8.10 using Elico pH –meter in 1:2 soil water suspension, organic carbon- .345 % [6], CEC (meq/100g) -3.4 [7] and % $CaCO_3$ -3.60 [8]. Field study was performed in 5 m^2 plots. Five different herbicide named metribuzin, pendimehalin, 2,4-D, metsulfuron methyl and clodinafop were obtained from a local agricultural dealer store in Aligarh. Three different concentrations of herbicides were applied as pre and post –emergent. Herbicides were applied with uniform dose of inorganic fertilizer (NPK) fertilizer @ 120: 60: 40 $Kgha^{-1}$. One half dose of nitrogen fertilizer was applied after 15 days of sowing. Seeds were sown manually @ 100 Kg ha^{-1}. Irrigation was done 6 times at different growth stages. Wheat was harvested at the maturity. Five samplings were undertaken at 0, 30, 60, 90 and 120 DAS (days after sowing) for soil nutrients study. The ammonium nitrogen (NH_4^+ N_2) was estimated by the method[9], available phosphorus reported by Olsen S.R. et al[10], available potassium by flame photometer and micro nutrients reported by Lindsay W. L. et al [11].

The results are the mean of the three replicates. Data were subjected to an analysis of variance (ANOVA) using least significance difference test and comparing the difference between specific treatments reported by Gomez K.A.[12].

Table-1
Effect of various herbicides given as low herbicide (LH), medium herbicide (MH) and high herbicide (HH) dose on ammonium nitrogen (NH_4^+–N_2) of wheat (*Triticum aestivum* L.) grown under $N_{120}P_{60}K_{40}$ uniformly

Herbicide concentrations (gai.)	Available NH_4^+–N_2 (mg kg^{-1})					
	30 DAS					
	Clodi.	2,4-D	Metsul.	Pendi.	Metri.	Mean
Control	20.05	20.05	20.05	20.05	20.05	20.05
LH	25.04	27.11	30.28	32.00	24.30	27.75
MH	26.60	28.00	31.30	33.20	25.44	28.91
HH	24.00	26.00	29.00	30.90	23.41	26.66
Mean	23.92	25.29	27.66	29.04	23.30	
	60 DAS					
	Clodi.	2,4-D	Metsul.	Pendi.	Metri.	Mean
Control	26.30	26.30	26.30	26.30	26.30	26.30
LH	30.00	32.19	36.50	38.21	29.23	33.23
MH	31.00	33.28	37.32	40.48	30.00	34.42
HH	29.00	31.00	35.10	37.05	28.19	32.07
Mean	29.08	30.69	33.81	35.51	28.43	
	90 DAS					
	Clodi.	2,4-D	Metsul.	Pendi.	Metri.	Mean
Control	31.00	31.00	31.00	31.00	31.00	31.00
LH	35.51	38.40	40.00	44.32	34.32	38.51
MH	37.84	40.00	41.28	45.12	35.00	39.85
HH	33.61	37.72	38.00	42.33	32.00	36.73
Mean	34.49	36.78	37.57	40.69	33.08	
	120 DAS					
	Clodi.	2,4-D	Metsul.	Pendi.	Metri.	Mean
Control	30.00	30.00	30.00	30.00	30.00	30.00
LH	33.40	35.32	38.19	39.11	32.19	35.64
MH	35.32	37.32	40.48	41.28	33.00	37.48
HH	32.51	36.04	36.52	38.52	31.00	34.92
Mean	32.81	34.67	36.30	37.23	31.55	

		C.D. at 5%	
DAS	Fertilizer	Herbicide	Interaction
30	0.180	0.161	0.360
60	0.219	0.196	0.437
90	0.253	0.226	0.506
120	0.239	0.213	0.477

Clodi = *Clodinafop*; Metsul = *Metsulfuron methyl*; Pendi = *Pendimethalin*; Metri = *Metribuzin* ;
A uniform basal dose of N : P : K @ 120 : 60 : 40 kg ha^{-1} was given.

Results and Discussion

The study revealed the impact of different herbicides on ammonium nitrogen, phosphorus and potassium (NH_4^+ N_2, P, and K) and micro nutrients (Cu, Mn, Zn and Fe) availability in Aligarh field soil with uniform dose of NPK under wheat cultivation. The study proved that soil contamination with herbicides disturbs the soil nutrient status adversely in comparison to control, although the actual disorder depends on the rate of herbicide. Overall the availability of NH_4^+ N_2, P, K and of Cu, Mn, Zn and Fe was maximum with pendimethalin @ 1000 gai. followed by metsulfuron methyl, 2,4-D and clodinafop (table 1-7). As in our study the availability of NH_4^+ N_2, P, K and Cu, Mn, Zn and Fe was negatively correlated to the herbicide concentrations. Metribuzin @ 250 gai. proved to be the least effective in increasing these both type of nutrients in soil. The availability of these macro nutrients increased up to 90 DAS

later decreased slightly. Pendimethalin @ 1000 gai. with inorganic fertilizer proved to be the best interaction for these (NH_4^+ N_2, P and K) nutrients increase which may have further improved the growth and yield of wheat as compared to other herbicides. But contrary to macro nutrients the micro nutrients marked maximum increase up to 30 DAS (days after sowing) only then declined at later stages with time and concentration. Noteworthy is the fact that the concentrations of both type i.e. macro and micro nutrients were higher in fertilized soils (NPK) as compared to control (table 1-7) indicating the role of the fertilizer for increasing these nutrients.

Table-2

Effect of various herbicides given as low herbicide (LH), medium herbicide (MH) and high herbicide (HH) dose on available phosphorus of wheat (*Triticum aestivum* L.) grown under $N_{120}P_{60}K_{40}$ uniformly

Herbicide concentrations (gai.)	Available phosphorus (mg kg^{-1})					
	30 DAS					
	Clodi.	2,4-D	Metsul.	Pendi.	Metri.	Mean
Control	12.80	12.80	12.80	12.80	12.80	12.80
LH	15.20	17.23	21.42	24.30	14.13	18.46
MH	16.30	19.35	22.80	25.70	15.88	20.01
HH	14.60	16.16	19.44	23.22	13.77	17.44
Mean	14.73	16.39	19.12	21.51	14.15	
	60 DAS					
	Clodi.	2,4-D	Metsul.	Pendi.	Metri.	Mean
Control	15.05	15.05	15.05	15.05	15.05	15.05
LH	18.00	20.00	24.10	27.06	17.50	21.33
MH	19.25	22.10	26.40	28.25	18.60	22.92
HH	17.80	19.75	22.40	26.50	17.30	20.75
Mean	17.53	19.23	21.99	24.22	17.11	
	90 DAS					
	Clodi.	2,4-D	Metsul.	Pendi.	Metri.	Mean
Control	18.00	18.00	18.00	18.00	18.00	18.00
LH	22.00	24.20	27.24	30.10	20.50	24.81
MH	23.85	26.90	29.16	32.30	21.83	26.81
HH	20.95	23.60	24.15	29.00	19.50	23.44
Mean	21.20	23.18	24.64	27.35	19.96	
	120 DAS					
	Clodi.	2,4-D	Metsul.	Pendi.	Metri.	Mean
Control	16.00	16.00	16.00	16.00	16.00	16.00
LH	20.10	22.16	25.23	28.20	18.40	22.82
MH	21.60	24.70	27.00	30.16	19.70	24.63
HH	18.75	21.50	22.00	27.00	17.10	21.27
Mean	19.11	21.09	22.56	25.34	17.80	

		C.D. at 5%	
DAS	Fertilizer	Herbicide	Interaction
30	0.121	0.108	0.242
60	0.140	0.125	0.280
90	0.163	0.146	0.326
120	0.149	0.133	0.298

Clodi = *Clodinafop*; Metsul = *Metsulfuron methyl*; Pendi = *Pendimethalin*; Metri = *Metribuzin* ;
A uniform basal dose of N : P : K @ 120 : 60 : 40 kg ha^{-1} was given.

Table-3

Effect of various herbicides given as low herbicide (LH), medium herbicide (MH) and high herbicide (HH) dose on available potassium of wheat (*Triticum aestivum* L.) grown under $N_{120}P_{60}K_{40}$ uniformly

Herbicide concentrations (gai.)	Available potassium (mg kg^{-1})					
	30 DAS					
	Clodi.	**2,4-D**	**Metsul.**	**Pendi.**	**Metri.**	**Mean**
Control	27.70	27.70	27.70	27.70	27.70	27.70
LH	30.60	32.12	34.52	39.12	29.62	33.20
MH	31.50	33.30	35.55	41.40	30.15	34.38
HH	29.70	31.00	33.30	37.27	28.52	31.96
Mean	29.88	31.03	32.77	36.37	29.00	
	60 DAS					
	Clodi.	**2,4-D**	**Metsul.**	**Pendi.**	**Metri.**	**Mean**
Control	29.90	29.90	29.90	29.90	29.90	29.90
LH	32.54	35.10	37.35	41.40	31.00	35.48
MH	34.65	36.45	38.25	42.75	32.60	36.94
HH	30.30	34.31	36.10	40.60	29.00	34.06
Mean	31.85	33.94	35.40	38.66	30.63	
	90 DAS					
	Clodi.	**2,4-D**	**Metsul.**	**Pendi.**	**Metri.**	**Mean**
Control	35.10	35.10	35.10	35.10	35.10	35.10
LH	37.00	40.60	43.10	49.52	36.00	41.24
MH	38.25	41.85	45.50	51.75	37.35	42.94
HH	36.90	39.00	42.00	48.00	34.11	40.00
Mean	36.81	39.14	41.43	46.09	35.64	
	120 DAS					
	Clodi.	**2,4-D**	**Metsul.**	**Pendi.**	**Metri.**	**Mean**
Control	30.00	30.00	30.00	30.00	30.00	30.00
LH	33.11	35.60	40.60	42.75	31.88	36.79
MH	34.30	36.90	41.40	44.10	32.83	37.91
HH	31.50	34.92	39.00	41.90	30.00	35.46
Mean	32.23	34.36	37.75	39.69	31.18	

		C.D. at 5%	
DAS	**Fertilizer**	**Herbicide**	**Interaction**
30	0.220	0.197	0.441
60	0.236	0.211	0.471
90	0.275	0.246	0.550
120	0.243	0.217	0.485

Clodi = *Clodinafop*; Metsul = *Metsulfuron methyl*; Pendi = *Pendimethalin*; Metri = *Metribuzin* ;
A uniform basal dose of N : P : K @ 120 : 60 : 40 kg ha^{-1} was given.

Table-4

Effect of various herbicides given as low herbicide (LH), medium herbicide (MH) and high herbicide (HH) dose on available Cu of wheat (*Triticum aestivum* L.) grown under $N_{120}P_{60}K_{40}$ uniformly

Herbicide concentrations (gai.)	Available Cu (mg kg^{-1})					
	30 DAS					
	Clodi.	2,4-D	Metsul.	Pendi.	Metri.	Mean
Control	6.37	6.37	6.37	6.37	6.37	6.37
LH	11.20	11.77	12.11	12.52	6.47	10.81
MH	11.43	12.00	12.29	12.73	6.60	11.01
HH	11.00	11.55	12.03	12.37	6.38	10.67
Mean	10.00	10.42	10.70	11.00	6.46	
	60 DAS					
	Clodi.	2,4-D	Metsul.	Pendi.	Metri.	Mean
Control	4.51	4.51	4.51	4.51	4.51	4.51
LH	6.71	7.20	7.47	7.77	5.60	6.95
MH	6.84	7.37	7.68	7.94	5.70	7.11
HH	6.60	7.11	7.35	7.65	5.34	6.81
Mean	6.17	6.55	6.75	6.97	5.29	
	90 DAS					
	Clodi.	2,4-D	Metsul.	Pendi.	Metri.	Mean
Control	3.75	3.75	3.75	3.75	3.75	3.75
LH	6.71	6.73	7.43	7.52	3.70	6.42
MH	6.81	6.94	7.55	7.60	3.89	6.56
HH	6.55	6.66	7.31	7.40	3.65	6.31
Mean	5.96	6.02	6.51	6.57	3.75	
	120 DAS					
	Clodi.	2,4-D	Metsul.	Pendi.	Metri.	Mean
Control	2.90	2.90	2.90	2.90	2.90	2.90
LH	6.10	6.12	7.14	7.22	3.60	6.04
MH	6.25	6.26	7.25	7.38	3.75	6.18
HH	5.95	6.00	7.00	7.13	3.49	5.91
Mean	5.30	5.32	6.07	6.16	3.44	

		C.D. at 5%	
DAS	Fertilizer	Herbicide	Interaction
30	0.071	0.064	0.142
60	0.045	0.040	0.090
90	0.042	0.038	0.085
120	0.039	0.035	0.079

Clodi = *Clodinafop*; Metsul = *Metsulfuron methyl*; Pendi = *Pendimethalin*; Metri = *Metribuzin* ;
A uniform basal dose of N : P : K @ 120 : 60 : 40 kg ha^{-1} was given.

Table-5

Effect of various herbicides given as low herbicide (LH), medium herbicide (MH) and high herbicide (HH) dose on available Mn of wheat (*Triticum aestivum* L.) grown under $N_{120}P_{60}K_{40}$ uniformly

Herbicide concentrations (gai.)	Available Mn (mg kg^{-1})					
	30 DAS					
	Clodi.	2,4-D	Metsul.	Pendi.	Metri.	Mean
Control	8.44	8.44	8.44	8.44	8.44	8.44
LH	10.30	10.40	11.06	11.16	8.32	10.25
MH	10.42	10.68	11.30	11.36	8.50	10.45
HH	10.10	10.26	10.88	10.98	8.14	10.07
Mean	9.82	9.95	10.42	10.49	8.35	
	60 DAS					
	Clodi.	2,4-D	Metsul.	Pendi.	Metri.	Mean
Control	6.70	6.70	6.70	6.70	6.70	6.70
LH	9.78	9.96	10.10	11.06	6.86	9.55
MH	9.94	10.08	10.24	11.32	7.12	9.74
HH	9.56	9.70	9.90	10.92	6.76	9.37
Mean	9.00	9.11	9.24	10.00	6.86	
	90 DAS					
	Clodi.	2,4-D	Metsul.	Pendi.	Metri.	Mean
Control	5.30	5.30	5.30	5.30	5.30	5.30
LH	8.76	8.90	9.68	9.98	6.26	8.72
MH	8.98	9.04	9.92	10.16	6.40	8.90
HH	8.60	8.76	9.58	9.70	6.10	8.55
Mean	7.91	8.00	8.62	8.79	6.02	
	120 DAS					
	Clodi.	2,4-D	Metsul.	Pendi.	Metri.	Mean
Control	4.80	4.80	4.80	4.80	4.80	4.80
LH	4.78	5.14	8.78	8.94	4.86	6.50
MH	4.98	5.28	9.02	9.10	4.94	6.66
HH	4.60	4.98	8.60	8.76	4.80	6.35
Mean	4.79	5.05	7.80	7.90	4.85	

		C.D. at 5%	
DAS	Fertilizer	Herbicide	Interaction
30	0.068	0.061	0.137
60	0.063	0.056	0.126
90	0.057	0.051	0.113
120	0.043	0.039	0.087

Clodi = *Clodinafop*; Metsul = *Metsulfuron methyl*; Pendi = *Pendimethalin*; Metri = *Metribuzin* ;
A uniform basal dose of N : P : K @ 120 : 60 : 40 kg ha^{-1} was given.

Table -6

Effect of various herbicides given as low herbicide (LH), medium herbicide (MH) and high herbicide (HH) dose on available Zn of wheat (*Triticum aestivum* L.) grown under $N_{120}P_{60}K_{40}$ uniformly

Herbicide concentrations (gai.)	Available Zn (mg kg^{-1})					
	30 DAS					
	Clodi.	2,4-D	Metsul.	Pendi.	Metri.	Mean
Control	2.74	2.74	2.74	2.74	2.74	2.74
LH	5.42	6.82	8.66	11.42	3.40	7.14
MH	5.84	7.10	9.00	11.78	3.92	7.53
HH	5.30	6.64	8.40	11.18	3.30	6.96
Mean	4.83	5.83	7.20	9.28	3.34	
	60 DAS					
	Clodi.	2,4-D	Metsul.	Pendi.	Metri.	Mean
Control	1.80	1.80	1.80	1.80	1.80	1.80
LH	2.42	2.68	2.72	4.64	1.86	2.86
MH	2.70	2.76	2.94	4.94	1.98	3.06
HH	2.24	2.58	2.56	4.48	1.78	2.73
Mean	2.29	2.46	2.51	3.97	1.86	
	90 DAS					
	Clodi.	2,4-D	Metsul.	Pendi.	Metri.	Mean
Control	1.62	1.62	1.62	1.62	1.62	1.62
LH	1.96	2.06	2.22	3.46	1.80	2.30
MH	2.02	2.24	2.42	3.92	1.90	2.50
HH	1.78	1.98	2.02	3.18	1.70	2.13
Mean	1.85	1.98	2.07	3.05	1.76	
	120 DAS					
	Clodi.	2,4-D	Metsul.	Pendi.	Metri.	Mean
Control	1.26	1.26	1.26	1.26	1.26	1.26
LH	1.34	1.50	1.58	1.66	1.26	1.47
MH	1.50	1.74	1.76	1.94	1.36	1.66
HH	1.20	1.36	1.40	1.56	1.20	1.34
Mean	1.33	1.47	1.50	1.61	1.27	

		C.D. at 5%	
DAS	Fertilizer	Herbicide	Interaction
30	0.048	0.043	0.096
60	0.019	0.017	0.039
90	0.015	0.014	0.031
120	0.010	0.009	0.020

Clodi = *Clodinafop*; Metsul = *Metsulfuron methyl*; Pendi = *Pendimethalin*; Metri = *Metribuzin* ;
A uniform basal dose of N : P : K @ 120 : 60 : 40 kg ha^{-1} was given.

Table-7

Effect of various herbicides given as low herbicide (LH), medium herbicide (MH) and high herbicide (HH) dose on available Fe of wheat (*Triticum aestivum* L.) grown under $N_{120}P_{60}K_{40}$ uniformly

Herbicide concentrations (gai.)	Available Fe (mg kg^{-1})					
	30 DAS					
	Clodi.	2,4-D	Metsul.	Pendi.	Metri.	Mean
Control	9.96	9.96	9.96	9.96	9.96	9.96
LH	10.60	10.92	10.96	12.34	10.50	11.06
MH	10.78	11.08	11.10	12.44	10.60	11.20
HH	10.44	10.78	10.80	12.16	10.34	10.90
Mean	10.45	10.69	10.71	11.73	10.35	
	60 DAS					
	Clodi.	2,4-D	Metsul.	Pendi.	Metri.	Mean
Control	8.64	8.64	8.64	8.64	8.64	8.64
LH	10.00	10.22	10.80	10.96	9.94	10.38
MH	10.12	10.40	10.98	11.14	10.10	10.55
HH	9.86	10.00	10.62	10.76	9.76	10.20
Mean	9.66	9.82	10.26	10.38	9.61	
	90 DAS					
	Clodi.	2,4-D	Metsul.	Pendi.	Metri.	Mean
Control	6.76	6.76	6.76	6.76	6.76	6.76
LH	8.20	8.56	8.82	9.00	7.84	8.48
MH	8.38	8.72	9.04	9.22	8.08	8.69
HH	8.00	8.40	8.66	8.80	7.60	8.29
Mean	7.84	8.11	8.32	8.45	7.57	
	120 DAS					
	Clodi.	2,4-D	Metsul.	Pendi.	Metri.	Mean
Control	5.28	5.28	5.28	5.28	5.28	5.28
LH	7.40	7.66	7.74	7.96	7.14	7.58
MH	7.60	7.84	7.92	8.12	7.30	7.76
HH	7.22	7.48	7.58	7.78	6.96	7.40
Mean	6.88	7.07	7.13	7.29	6.67	

		C.D. at 5%	
DAS	Fertilizer	Herbicide	Interaction
30	0.074	0.067	0.149
60	0.069	0.062	0.138
90	0.056	0.050	0.112
120	0.049	0.044	0.098

Clodi = *Clodinafop*; Metsul = *Metsulfuron methyl*; Pendi = *Pendimethalin*; Metri = *Metribuzin* ;
A uniform basal dose of N : P : K @ 120 : 60 : 40 kg ha^{-1} was given.

Generally use of herbicides results in increase of some bacterial and fungal population, which ultimately affects nutrients in soil [13,] as increase in the available NH_4^+ N_2 may be due to increase in actinomycetes and nitrifying bacteria. Similarly, the *Pseudomonas* spp. of bacteria became dominant after herbicide addition in soil, which is responsible for more release and solubilisation of phosphate in soil. Increase in available K might be either due to release of fixed K from mineral lattice or solubilisation effects caused by certain fungi (*A. niger*) and bacteria (*Bacillus siliceous*), which may have decomposed the alumino silicate minerals thus released portion of K contained therein. Such results are also reported by others[14].

While considering the role of optimum concentration of herbicides (Pendimethalin @ 1000 gai. and of other herbicides), it may be due to suppression and/or elimination of weeds and the pathogenic population and also the probable increased population of saprophytic fungi, bacteria responsible for ammonification, nitrification and detoxification, which may have promoted better mineralization and availability of these macro and micro nutrients in soil and increased seed yield of wheat as reported in this study. While the use of tables 1 to 7.

Inorganic fertilizer increased the availability directly in soil. Thus use of herbicides with fertilizers may have exerted a favourable effect on wheat growth and yield as noted in this experiment. Recommended or medium dose positively affected the barley yield [15]. Reason behind this may be that higher dose of herbicide may have exerted a negative influence on soil nutrients by disturbing the soil physicochemical and biological properties etc. and also these chemicals are transported in all plant tissues, cellular structures which may finally lead to yield loss also[16].

Conclusion

The main objective of the study was to assess the effects of different concentrations of different herbicides in Aligarh field soil with NPK and to find out the optimum dose of suitable herbicide for wheat growth and yield in field situation. Use of metribuzin @ 250 gai. proved excessive and least effective for Aligarh field soil as it is a selective herbicide with systemic mode of action , have very low degradation at higher temperature also and greatly affects the photosysnthesis. Thus affects largely soil as well as plant. Our study proved that pendimethalin @1000 gai. with fertilizer proved best treatment for soil nutrients as well as for wheat. It is because of the fact that different herbicides have different structure and degradation processes in soil like herbicide with polar group viz. OH, COOH, NH_2 like pendimethalin are easy to microbial degradation while herbicide with halogenated and alkyl, chlorinated group like clodinafop, 2,4-D and metsulfuron methyl and metribuzin having Cl, F, S in the ring are hard to degrade in soil and thus affects soil nutrients and plant. Even soil properties also affect degradation of these different type of herbicides. Which might have affected the performance of these herbicides differently?

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