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EFFECT OF DIFFERENT WHEAT GENOTYPES ON WEED SPECIES

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Abstract: ln field studies conducted during 2015-16 and 2016-17, the influence of wheat geno*types* of different stature i.e. tall, medium and dwarf on the growth and development of *Phalaris minor*, *Chenopodium album* and *Melilotus indica* was studied. The tall wheat genotype (plant height about 115 cm) exerted a strong suppressing effect on the weed intensity (population & dry matter) and height of these weeds. The dwarf wheat genotypes proved very favourable for the growth and development of these weed species.
Keywords: Wheat, Genotypes, Weed, Growth.

Introduction

Under natural field conditions, seeds of *Phalaris minor* Retz. (Canary grass), *Chenopodium album* L. (Lamb's quarter) and *Melilotus indica* All. (Yellow sweet clover) which are typical winter season weeds, do not germinate in summer and stay dormant till temperature conditions become favourable for their germination from end of October onwards. *Phalaris* is a major weed in irrigated wheat and and has been reported to reduce the wheat yield by 25-50% and in very severe cases, it may go up to 80% to total failure (Bhan and Sushil Kumar, 1998). All the weed control methods - chemical, mechanical/cultural are directed towards shifting the growth margin in favour of the crop plants to exert a strong smothering effect on weeds (Singh *et* al., 2018). By advancing, the date of sowing wheat to mid-October or so when *Phalaris* seeds are still under temperature induced seed dormancy, wheat can assume a meaningful growth superiority over later emerging *Phalaris* plants and thus, the crop may be in a better position to suppress the growth and development of *Phalaris* and other weeds. Further, dwarf wheat cultivars have become increasingly popular due to their higher yield potential compared with indigenous tall cultivars. A study of the influence of height of wheat genotypes of different stature on the growth of *Phalaris* may generate some information on the increasing density of this weed, particularly in dwarf wheat in irrigated North-Western Plain Zone comprising Punjab, Haryana, Delhi and Uttar Pradesh. In view of this, a field experiment was planned to study the influence of wheat cultivars of different stature sown on

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different dates on the growth and development of *Phalaris minor, Chenopodium album* and *Melilotus indica.*

Materials and Methods

The field studies were conducted in the Experimental farm of ICAR-National Bureau of Plant Genetic Resources, New Delhi during 2015-16 and 2016-17. The soil of the experimental field was sandy loam with organic carbon 0.40 and 0.42%, available N 161.2 and 162.3 kg/ha, available P 12.8 and 13.4 kg/ha, available K 171.2 and 173.6 kg/ha, pH 7.3 and 7.5 during 2015-16 and 2016-17, respectively. The field had natural infestation of all the three weed species under study. The experiment was laid out in split. Plot design with five dates of sowing (details given in Table 1-2) in the main plots and wheat cultivars (C 306-tall variety, WL 711-semi dwarf variety and WL 903-dwarf variety) in the sub-plots and all the treatments were replicated three times. The recommended dose of fertilizers was given i.e. for semi-dwarf and dwarf cultivars 125 kg N, 62.5 kg P_2O_5 and 30 kg K_2O / ha and for tall cultivar (C 306), it was 50% less than that of semi-dwarf and dwarf genotypes. Full dose of phosphorus, potash and half dose of nitrogen was applied at the time of sowing and remaining half of nitrogen was applied with first irrigation (3-4 weeks after sowing). The crop was sown by dropping the seed behind the plough in the furrow and a seed rate of 80 kg/ha was used, keeping seed rate per row constant. The gross plot size was 3.0 m x 8.0 m. *Phalaris* intensity and height was recorded at the maturity stage of crop. In addition to this, data on *C. album* and *M. indica* were also recorded using a quadrat of 30 cm x 30 cm. The height of crop plants and *Phalaris* plants was recorded from ground level up to the base of ear head (peduncle) but in case of *C. album* and *M. indica* it was recorded up to the tip of apex of the main shoot.

Results and Discussion

Effect on the growth and intensity of weeds

(a) *Phalaris minor* Retz. (Canary grass)

The height of *P. minor* plants was significantly influenced by the type of wheat genotype. The height of *P. minor* growing in association with the tall wheat genotype (C 306) was significantly less as compared to *Phalaris* plants growing in dwarf wheat genotype (WL. 903) during 2015-16 and 2016-17. The tall genotype reduced the height of *P. minor* plants by 15.3%. Similar findings have been reported by Paul and Gill (1979). In our present studies, the difference in height of *P. minor* when growing in association with semi dwarf and dwarf genotypes was not materially different. However, due to a distinct difference of 22.5 cm

(Table 1) in the plant height of semi-dwarf and dwarf wheat genotypes the *Phalaris* plants grow out well above the crop line and get enough space and light for its growth and development. Likewise, the number of tillers/ plant of *Phalaris* was also favourably influenced by the semi-dwarf/dwarf wheat genotypes. The dry weight of *Phalaris* per plant was significantly lower when growing in tall wheat genotype than in semi-dwarf and dwarf wheat cultivars (Table 1 & 2). The value of this parameter was significantly higher in the medium dwarf than the tall genotype. These data thus indicate that the dwarfness of the wheat genotypes favourably influences the growth of this weed. The number of panicles/m^2 of *Phalaris* was lowest in case of first sowing of wheat on October 24 (Table 1). The differences in the number of panicles of *P. minor/*m^2 at maturity were rather inconsistent; however, first date of sowing i.e. mid October had the lowest number of *P. minor* panicles/m^2 (Table 2). It appears that early development of 'foliar mass of wheat under first sowing asserts an inhibitory effect on the emergence/ development of *Phalaris* plants. The differences in the height of *Phalaris* were in favour of early sowing and the *Phalaris* plants had lowest plant height in case of December sowmg.

(b) *Chenopodium album* L. (Lamb's quarter) and *Melilotus indica* All. (Yellow sweet clover)

The population of these weeds was also greatly influenced by the type of wheat genotype, their number being significantly higher when growing in association with dwarf wheat genotype (WL 903). The dry weight per plant of these weed species was also significantly higher when growing in the dwarf wheat genotype (Table 3). These data thus convincingly show that crop genotypes with reduced plant height favourably influenced the growth of *C. album* plants growing in different wheat genotypes were significant; it being significantly higher when growing in dwarf wheat genotypes compared to its height in the tall genotype (C 306). The height of *Melilotus* was also favourably influenced by the dwarf wheat genotypes. These data on the growth and development of *P. minor, C. album* and *M. indica* growing in association with wheat genotypes of different stature show that the dwarf wheat genotypes are not conducive for rank weed growth. Due to their better yield potential, the wheat breeder has shown keen interest in developing dwarf wheat cultivars since they are responsive to higher levels of fertilizers and irrigations and are resistant to lodging as well. However, it may be pointed out that in the absence of an effective weed control programme in dwarf/ semi-dwarf wheat cultivars, the maximum yield potential of these cultivars may not be possible to attain. Based on our present investigations, dwarf wheat genotypes have proved most conducive for the growth and development of *Phaiaris, C. album* and *M. indica* which

are dominant weeds of this crop. It may be advisable to go in for medium dwarf varieties which combine a reasonably good level of yield and adequately smoother the weeds. The tall genotypes though have good smothering potential, are comparatively low yielder.

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Table 1: Effect of date of sowing and wheat genotypes on the growth of weeds and crop at maturity stage of the crop (2015-16)

Treatments	No. of *P. minor* panicles/m^2	Plant height *P. minor* (cm)	Dry weight/plant of *P. minor (g)*	Population of *C. album*/m^2	Population of *M. indica*/m^2	Dry weight/plant of *M. indica (g)*	Wheat plant height (cm)
Dates of sowing							
24/10/2016	16	82.1	2.39	22	18	4.09	83.7
11/11/2016	26	86.6	2.22	21	19	2.16	87.4
23/11/2016	19	76.4	1.90	19	19	2.65	81.7
08/12/2016	26	76.8	1.95	19	23	2.29	72.2
23/12/2016	21	75.0	2.71	29	25	5.02	55.6
L.S.D (P=0.05)	N. S.	6.0	N. S.	N. S.	N. S.	N. S.	07.6
Wheat cultivars							
C 306	13	69.8	1.37	17	13	2.22	114.9
WL 711	16	84.8	1.84	19	18	2.28	83.7
WL 903	36	82.4	3.48	31	31	5.23	60.9
L.S.D (P=0.05)	05	07.0	0.36	06	10	1.34	04.1

Table 2: Effect of dates of sowing and wheat genotypes on the growth of *Phalaris minor* and crop at maturity (2015-16 and 2016-17)

Treatments	No. of *Phalaris* panicles/m^2			Plant height of *Phalaris* (cm)			No. of tillers/plant of *Phalaris*			Dry wt./plant of *Phalaris*(g)			Wheat plant height (cm)		
	15-16	16-17	Mean	15-16	16-17	Mean	15-16	16-17	Mean	15-16	16-17	Mean	15-16	16-17	Mean
Dates of sowing															
October 24	16	19	17.5	82.1	68.9	88.7	2.0	2.1	2.05	2.39	4.25	3.32	83.7	85.8	84.7
November 11	26	25	25.5	86.6	95.4	91.0	1.8	2.0	1.90	2.22	4.01	3.1	87.4	88.2	87.8
November 23	19	23	21.0	76.4	105.2	90.8	1.9	2.0	1.95	1.90	5.04	3.4	81.7	89.3	85.5
December 8	26	24	25.0	76.8	88.4	82.6	1.7	3.0	2.35	1.95	3.45	2.7	72.2	86.9	79.5
December	21	23	22.0	75.0	66.6	70.8	1.9	2.7	2.30	2.71	2.17	2.4	55.6	82.5	69.0

23															
L.S.D (P=0.05)	NS	NS	-	NS	15.9	-	NS	0.7	-	1.19	NS	-	NS	5.1	-
Wheat cultivars															
C 306	13	12	12.5	66.3	65.3	65.8	1.3	1.8	1.55	4.09	2.75	3.82	114.9	111.5	113.2
WL 711	16	18	17.0	82.9	88.9	85.8	1.7	2.4	2.05	6.85	3.31	5.08	83.7	87.3	85.5
WL 903	36	29	32.5	91.8	100.6	96.2	1.9	2.8	2.35	10.02	5.30	7.66	60.9	60.9	60.9
L.S.D (P=0.05)	2	6	-	8.5	12.8	-	NS	0.4	-	1.02	1.57	-	4.6	3.8	-

Table 3: Effect of date of sowing and wheat genotypes on the growth of *C. album* and *M. indica*(2015-16 and 2016-17)

Treatments	Population/m^2 at harvest			*Chenopodium album*						*Melilotusindica*					
				Plant height (cm)			Dry weight/plant (g)			Plant height (cm)			Dry weight/plant (g)		
	15-16	16-17	Mean	15-16	16-17	Mean	15-16	16-17	Mean	15-16	16-17	Mean	15-16	16-17	Mean
Dates of sowing															
October 24	20	53	36.5	77.9	96.5	87.2	6.08	24.13	15.10	59.8	66.5	63.1	5.73	4.42	5.08
November 11	15	22	18.5	87.8	78.6	83.2	8.33	08.95	08.64	69.8	85.2	77.5	7.83	4.63	6.23
November 23	13	12	12.5	74.1	64.7	69.4	8.50	05.98	07.24	58.8	64.8	61.8	8.11	1.90	5.00
December 8	12	13	12.5	74.3	58.9	66.6	8.19	07.44	07.81	59.4	44.8	52.1	7.23	1.86	4.54
December 23	12	11	11.5	81.9	37.5	59.7	7.43	02.25	04.84	56.0	35.1	45.5	5.08	1.69	3.38
L.S.D (P=0.05)	05	32	-	NS	14.4	-	NS	08.42	-	NS	25.3	-	2.18	2.52	-
Wheat cultivars															
C 306	11	11	11.0	72.1	52.0	62.0	54.4	07.33	06.58	51.6	54.1	52.8	5.01	2.30	3.65
WL 711	13	18	15.5	81.8	62.0	71.9	07.68	10.14	08.91	64.8	57.8	61.3	5.40	2.99	4.19
WL 903	19	32	25.5	83.6	74.0	78.8	10.01	11.94	10.97	65.8	65.8	65.8	9.98	3.46	6.72
L.S.D (P=0.05)	02	09	-	6.6	10.0	-	02.30	03.14	-	NS	NS	-	2.35	NS	-