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Dry Matter Accumulation Pattern and Yield of Wheat (*Triticum aestivum* L.) as Influenced by Weed Control Methods and Nitrogen Levels

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ABSTRACT

The studies carried out during *rabi* seasons of 1986-87 and 1987-88 revealed that the higher periodical total dry matter production and grain yield per plant of wheat were obtained under the weed control treatments of fluchloralin at 1.0 kg/ha, two hand weedings and pendimethalin at 1.0 kg/ha. There was linear response to nitrogen fertilization from 60 to 150 kg N/ha for dry matter accumulation/plant through out the growth period of wheat crop. But the grain yield/plant was statistically similar in both the higher levels of 120 and 150 kg N/ha.

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INTRODUCTION

The future of wheat crop is bright in Gujarat state as the area under irrigation is likely to increase because of various irrigation projects in progress including Sardar Sarover Project on Narmada river. Wheat is the only crop which can be best suited in *rabi* season of the existing cropping pattern and as such it has to play a vital role in the state economy in coming years. The average grain yield of wheat in India in general and Gujarat in particular is considerably low. Amongst the various factors responsible for such low yield, ineffective control of weeds and improper application of nitrogenous fertilizers are the most important ones.

Uncontrolled weed growth may reduce the dry matter accumulation and grain yield to the extent of 10 to 44 per cent. (Pandey *et al.*, 1980; Bhagat and Jain, 1985). The nitrogenous fertilizer enhanced the dry matter accumulation in wheat crop. The maximum respose to applied N for the highest dry matter was ranged between 80 to 200 kg/ha (Singh and De, 1978; Walia *et al.*, 1980).

Study of dry matter accumulation by a crop is useful for formulating a sound and economic weed and fertilizer management programme. Keeping thses facts in view, the present investigation was undertaken at Gujarat Agricultural University Campus, Navsari.

MATERIALS AND METHODS

A field experiment was conducted at the Agricultural College Farm, Navsari (Gujarat) during 1986-87 and 1987-88. The soil of the experimental field was clayey in texture, low in total nitrogen (0.047 - 0.084 %) and available phosphorus (24.0 - 24.8 kg/ha) and rich in available potash (377 - 378 kg/ha) with alkaline in reaction (pH 8.2).

The study involved six weed control treatments viz., unweeded control (W_1), two hand weeding at 20 and 40 days after sowing (recommended practice) (W_2), application of isoproturon at 1.0 kg a.i./ha (W_3), pendimethalin at 1.0 kg a.i./ha (W_4), anilofos

at 0.4 kg a.i./ha (W_5) (all pre emergence) and fluchloralin at 1.0 kg a. i./ha (post emerence 10 days after sowing) (W_6), in main plots and four levels of nitrogen i.e., 60, 90, 120 and 150 kg N/ha in sub plots with four replications in a split plot design. Half of the nitrogen (as per treatment) and a common dose of 60 kg P_2O_5/ha was applied at the time of sowing and remaining nitrogen was given 21 days after sowing (DAS). Wheat variety GW-120 was sown at a row spacing of 22.5 cm under irrigated conditions. The crop was sown on 25-11-86 and 30-11-87 and was harvested on 3-3-87 and 6-3-88 during the years 1986-87 and 1987-88, respectively.

RESULTS AND DISCUSSION

Dominant weeds associated with the wheat crop were *Cynadon dactylon* (L.) Pers., *Echinocloa colonum* L., *Digera arvensis Forsk*, *Euphorbia* spp. and *Cyperus rotundus* L.

In general, the dry matter accumulation per plant of wheat was increased gradually with an advancement of age of the crop. The rate of accumulation was more between 40 to 60 DAS during the course of investigation (Table-1).

(A) Effect of weed control methods

Total dry matter production was significantly lower in isoproturon (W_3) treatment at initial stage (20 DAS) due to its phytotoxic effect on crop growth. From 10 DAS till harvest, total biomass production of wheat plant was enhanced by application of fluchloralin at 1.0 kg/ha. It was closely followed by hand weeding twice and pendimethalin treatments in both the years and in data pooled at harvest. It might be due to the least competition between crop and weeds for essential commodities under these treatments which offered better development of growth parameters and ultimately dry matter production. The beneficial effects on growth attributes were also reported by Chauhan and Verma (1978) and Bhatia *et al.* (1981) with the application of fluchloralin and by Kumar *et al.*, (1986) with pendimethalin and

TABLE 1

Periodical mean dry matter accumulation (g/plant) of wheat as affected by weed control methods and nitrogen levels.

Treatments	Dry matter accumulation in g/plant (Days after sowing)								At harvest		
	20		40		60		80				
	86-87	87-88	86-87	87-88	86-87	87-88	86-87	87-88	86-87	87-88	Pooled
Weed control											
W_1 - Unweeded control	0.25	0.24	1.04	1.03	2.97	2.59	4.75	4.14	4.58	4.28	4.43
W_2 - Two hand weedings	0.26	0.24	1.31	1.27	3.60	3.44	5.76	5.51	5.79	5.08	5.44
W_3 - Isoproturon	0.18	0.19	1.01	0.93	3.03	2.72	4.84	4.35	5.15	4.70	4.92
W_4 - Pendimethalin	0.25	0.26	1.31	1.20	3.70	3.36	5.92	5.37	5.68	5.04	5.36
W_5 -- Anilofos	0.26	0.25	2.21	1.14	3.57	3.19	5.72	5.11	5.24	5.10	5.17
W_6 - Fluchloralin	0.25	0.25	1.39	1.38	3.82	3.74	6.12	5.98	5.87	5.39	5.63
S.Em.±	0.01	0.01	0.04	0.05	0.10	0.08	0.15	0.13	0.11	0.10	0.08
C.D. at 5%	NS	0.02	0.11	0.14	0.27	0.24	0.46	0.39	0.34	0.30	0.22

1	2	3	4	5	6	7	8	9	10	11	12
Nitrogen (kg/ha)											
N_1—60	0.24	0.21	0.80	0.78	2.88	2.59	4.61	4.14	3.32	3.02	3.17
N_2—90	0.24	0.21	1.18	1.13	3.32	2.97	5.30	4.75	5.26	4.78	5.02
N_3—120	0.25	0.26	1.36	1.26	3.63	3.41	5.81	5.46	6.11	5.79	5.95
N_4—150	0.24	0.27	1.51	1.45	3.97	3.72	6.34	5.95	6.86	6.14	6.50
S.Em.±	0.01	0.01	0.04	0.04	0.08	0.09	0.12	0.14	0.08	0.08	0.10
C.D. at 5%	0.03	0.03	0.11	0.10	0.21	0.25	0.34	0.40	0.21	0.23	0.24

TABLE 2

Dry matter accumlation (g/plant) of wheat at harvest as affected by interaction effect of weed control methods and nitrogen levels during 1986-87.

Nitrogen level	*Weed control method*					
	W_1	W_2	W_3	W_4	W_5	W_6
N_1	2.96	3.45	3.32	3.41	3.39	3.37
N_2	4.87	5.64	5.12	5.64	4.86	5.41
N_3	5.04	6.72	5.90	5.90	6.14	6.93
N_4	5.46	7.34	6.24	7.78	6.57	7.78
	S.Em±	0.18		C.D. at 5%	0.52	

TABLE 3

Grain yield (g/plant) of wheat as affected by different treatments.

Treatments	*Grain yield g/plant*		
	86-87	*87-88*	*Pooled*
Weed control			
W_1—Unweeded control	1.63	1.55	1.59
W_2—Two hand weedings	3.06	2.81	2.94
W_3—Isoproturon	2.54	2.23	2.39
W_4—Pendimethalin	3.41	2.66	3.04
W_5—Anilofos	3.09	2.70	2.90
W_6—Fluchloralin	3.50	3.24	3.37
S.Em.±	0.06	0.04	0.12
C.D. at 5%	0.16	0.13	0.41
Nitrogen (kg/ha)			
N_1—60	2.03	1.72	1.88
N_2—90	2.66	2.38	2.52
N_3—120	3.21	3.05	3.13
N_4—150	3.58	2.97	3.27
S.Em.±	0.05	0.04	0.10
C.D. at. 5%	0.14	0.12	0.44

two hand weeding treatments. The values of growth attributes were the least in unweeded control plots and isoproturon treatments due to weed competition. Gautam and Singh (1981) and Bhagat and Jain (1985) also reported the lower values of growth attributes, if weeds were not controlled. The trend of grain yield per plant as affected by weed control treatments was more or less similar to that of total dry matter production per plant (Table-3).

(b) Effect of Nitrogen

At initial stage (20 DAS), nitrogen levels could affect the dry matter production only during 1987-88. But from 40 days onwards till harvest, dry matter accumulation/plant of wheat was increased significantly with an increase in nitrogen application rate from 60 to 150 kg N/ha at all the stages during both the years and in pooled analysis at harvest (Table-1). This behaviour of treatments can be explained with the role of N in plant body. Higher supply of nitrogen might have incresed the photosynthetic efficiency of leaves and thus increased the availability of photosynthetes, resulting in over-all increase of dry matter production. These results are in line with those of Singh and De (1987) and Walia *et al.* (1980), however, non-significant differences between 120 and 180 kg N/ha were recorded by Pandey *et al.* (1986). The grain yield/plant of wheat linearly responded to nitrogen upto 120 kg/ha only (Table-3), further increase in yield due to 150 kg N/ha was not appreciable.

(C) Interaction effect

Interaction of various weed control treatments with nitrogen levels during 1986-87 (Table-2), postulated that dry matter accumulation of wheat at harvest was increased if weeds were controlled either by fluchloralin, pendimethalin or two hand weeding treatments where applied @ 150 kg N/ha. Singh *et al.* (1984) also reported the similar results.

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