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Growth and yield of wheats as affected by gamma irradiation under rainfed condition and their relationships.*

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An experiment was carried out during the two consecutive winter seasons of 1978-79 and 1979-80 in the Agricultural Farm of Banaras Hindu University with four wheat varieties and five radiation doses to find out their growth pattern and yield under rainfed condition. Among the varieties Kalyan Sona exhibited higher growth values and yield in both the years, closely followed by UP-262 and in the case of radiation doses the seeds treated with 6kr superseded all other doses in these characters except plant height where 3 kr produced the tallest plant. Futther more, yield was found to be positively correlated with leaf number tiller number and dry weight per plant and negatively correlated with plant height.

Most of the high yielding wheat varieties evolved so far are ill-equipped for rainfed cultivation, as they have to grow on stored soil moisture that decreases with time. Many experimental evidences show the possibility of hastening the developmental processes of plant and increasing yield through irradiation with ionizing radiation because of radiostimulation phenomenon (Savin, 1968 and Misra & Sen, 1982). Keeping this in view an experiment was conducted to find out the effect of radiation doses on the growth and yield of wheat and their interrelationships under rainfed condition.

MATERIAL AND METHODS

The field experiment was carried out during the winter seasons of 1978-79 and 1979-80 at Banaras Hindu University, Varanasi. The trial was laid out under rainfed condition adopting a split plot design with three replications keeping varieties (kalyan Sona. HD(M) 1553. Up-262 and Malaviya-12) in the main plots and radiation doses (0,3,6,9 and 12 kr) in the sub plots. The seeds were irradiated with gamma rays before sowing. The soil of the experimental field was sandy loam in texture having 20kg and 210 kg of available phosphorus and potash per hectare respectively. The soil pH was 7.6 and organic carbon was 0 402%. A common fertilizer doss of 60,40 and 30 kg of N P_2O_5 and K_2O per hectare were applied just before the time of sowing. Biometric description were made. The mathod followed for correlation coefficient studies was as given by Panseand Sukhatme (1967).

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RESULTS AND DISCUSSION

Varietal differences :

Varieties showed highly significant differences for all the growth characters studied viz; plant height. leaf number, tiller number and dry weight per plant during both the years (Table-1). True to its genetic character, the single gene dwarf HD(M) 1553 was taller than all other varieties which were incidentally double gene dwarfs. However, Kalyan Sona showed higher values in tiller number, leaf number and dry weight per plant followed by Up-262 and Malaviya-12 while HD(M) 1553 exhibited the lowest values. Dry matter production is a function of the product of tillers, leaves/plant and plant height, Kalyan Sona possessing comparatively greater number of tillers and leaves associated with moderate height, was naturally in a position to accumulate higher dry matter than other varieties. This trend ultimately led to the higher grain yield by Kalyan Sona. Superior yield performance of Kalyan Sona under rainfed condition was also observed by Swaminathan (1968).

Radiation doses :

Radiation doses brought about significant differences in all the characters. The dose 6kr followed by 3kr recorded higher tiller number, leaf number and dry weight/plant and ultimately higher grain yield than other doses during both the years. Only in the case of plant height it was observed that 3kr surpassed all other doses. it has been found that lower doses of radiation stimulate plant growth most probably due to 'radio stimulative effect'. Higher doses depressed the plant growth and development (Ananthaswamy *et al*; 1971).

In the correlation coefficient studies grain yield was found to be positively correlated with leaf number, tiller number and dry weight of shoot per plant (Table-2). The relationship among dry weight of shoot. tiller number and leaf number/plant was positive and significant. It is most probably due to the fact that major source of variation in dry weight of wheat which ultimately leads to greater grain yield, is tiller number (Puckridge and Donald, 1967)

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Table-1 : Effect of treatments on growth, dry matter accumulation and yield

Treatments	Plant height (cm)		Tiller number/ plant		Leaf number/ Plant		Dry weight of shoot/plant (g)		Grain yield(q/ha)	
	1978-79	1979-80	1978-79	1979-80	1978-79	1979-80	1978-79	1979-80	1978-79	1979-80
Varieties										
Kalyan Sona	78 6	81.0	6.7	7.1	6.2	7.8	12.5	12.7	23.0	26.42
HD(M) 1553	84.1	86.1	6.0	6.2	3.7	4.9	10.6	11.7	18.3	20.32
UP-262	80.1	84.0	6.5	6.8	5.3	6.7	12 0	12.5	21.4	24 40
Malaviya-12	77.1	78.5	6.1	6.2	3.8	5.1	11.7	12.1	20 4	22.84
C.D. at 5%	3 4	3.5	0 5	0.2	0 4	0.5	0.1	0 5	2.0	1 69
Radiation doses										
0 kr	80.1	81.5	5.0	5.7	4.3	5.5	10.5	11.7	18.2	20.6
3 kr	82.8	86.7	6.7	7.0	4.9	6.4	12.1	12.7	21.7	25.4
6 kr	80.5	83.1	6 9	7.2	5.3	7 2	12.4	12 9	23.4	26.7
9 kr	78.5	80.7	6.4	6.6	4.7	6.0	12 0	12.2	20.8	23.6
12 kr	78.0	79.8	6.1	6 1	4.6	5.7	11.5	11.8	19.8	22 5
C.D. at 5%	2.2	2.6	0.8	0.3	0 7	0.7	0.6	0.5	1.5	1.3

Table-2 Correlation co-efficient between different characters

Characters	Leaf number/plant		Tiller number/plant		Plant height		Dry weight/plant	
	1978-79	1979-80	1978-79	1979-80	1978-79	1979-80	1978-79	1979-80
Yield	0.817*	0.896*	0.950*	0.968*	-0.188	0.147	0.967*	0.977*
Leaf number plant			0.733*	0.837*	-0.291	0.091	0.770*	0.845*
Tiller number plant					0.030	0.340	0.931*	0.976*
height							-0.306	0.238

*Significant at 5% level.