5. **Discussion**

The findings of research work given in the preceding chapter are discussed in this chapter in the light of scientific reasons to establish the cause and their effect.

5.1. **Effect of Time of first irrigation.**

Time of first irrigation has been established as the most limiting factor as regards the yield of wheat crop. The optimum time of first irrigation in wheat is crown root initiation, a well-decided fact. Crown root initiation is influenced by several factors viz. sowing time, fertility levels, varieties, presowing conditions etc. So the time at which first irrigation starts has not been universally fixed as yet. It is found to affect the growth of the plant to an extent to be detrimental for the yields. The variation in growth and yield of wheat due to time of irrigation has been reported by several workers. The grain yield in wheat is a function of number of fertile tillers per unit area, number of grains per ear and test weight. All these three yield attributes decided by the growth of the plant, are significantly affected by the time of first irrigation. The scientific effect of time of first irrigation on number of fertile tillers, number of grains per ear and test weight has been noted by various workers (Sharma and Dhardwaj (1983),
Anonymous (1984-85) and Sharma et al (1985). The highest grain yield in the present work was noted when the first irrigation was applied at 27 days after sowing in 1983-84 and 20 days after sowing in 1984-85 which were significantly superior to the delayed timings of first irrigation during both the years. The maximum yields obtained were 32.28 g/ha and 35.79 g/ha during 1983-84 and 1984-85 respectively. This increase in yield may be due to more number of fertile tillers, number of grains and test weight noted under the same time of first irrigation. Maximum number of functional leaves at all the stages was also noted under the same time of first irrigation. As these leaves are taking part in the synthesis of food material by the process of photosynthesis, the more in the leaf area, more will be the net photosynthesis or production of carbohydrates which in turn results into the better growth in increasing the length of reproduction phase during which the grains are formed. Longer the reproduction phase, greater will be the accumulation of food reserve. More number of fertile tillers or productive tillers noted under the same time of first irrigation may be attributed to decreased competition for water among the tillers establishing the tillers in good health and early in time, which in turn may give more number of fertile spikelets per ear, more number of grains per ear and the higher test weight. The dry matter production per plant was also maximum when the first irrigation was applied at 27 days after sowing
being 3.304 g/shoot and 3.327 g/shoot at maturity stage during 1983-84 and 1984-85 respectively.

The findings corroborate with the findings of several person viz. Mathur and Shekhawat (1971), Singh et al. (1977); Anonymous (1984-85) and Bhardwaj et al (1985).

As regards the quality, protein content of grain was significantly influenced by the time of first irrigation. Delay in first irrigation beyond 27 days after sowing resulted into a reduction in protein content of seed.

5.2. Effect of Nitrogen

Of all the soil nutrients nitrogen is the most limiting factor as regards the yield of most of the field crops. It being a constituent part of protein is needed for growth and other physiological processes, plays an important role in plant life cycle and thus decides the yield of crop. Since Indian soils are deficient in nitrogen they respond well to it's application. Therefore, for getting good yields nitrogen is a must in modern agriculture, because at present we have improved varieties of most of the crops responding to the higher doses of nitrogen.
Crops sown with soaked seeds exhibited its superiority over dry and sprouted seed conditions in 1983-84 and over dry condition in 1984-85 (table 85).

Significant interaction (table 88) noted during 1983-84 revealed that all the varieties behaved similarly under sprouted seed conditions as regards the productivity of tillers, however under sowing with soaked seeds variety HD 2329 gave poor productivity of tillers than HD 2285. The reverse was true under dry seed sowing. Comparing seed conditions it was observed that in variety HD 2329 neither method resulted into significant difference over other, however in varieties HD 1553 and HD 2285 sowing with soaked seeds showed its superiority over dry and sprouted seeds sowing.

Table 87: Effect of seed conditions on number of ears/m² in different varieties during 1984-85.

<table>
<thead>
<tr>
<th>Varieties</th>
<th>Number of ears/m²</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Dry</td>
</tr>
<tr>
<td>HD 1553</td>
<td>234.75</td>
</tr>
<tr>
<td>HD 2285</td>
<td>252.25</td>
</tr>
<tr>
<td>HD 2329</td>
<td>356.50</td>
</tr>
<tr>
<td>SJm⁺</td>
<td>14.48</td>
</tr>
<tr>
<td>CD 5%</td>
<td>42.00</td>
</tr>
</tbody>
</table>
soil which may result into the response of wheat to nitrogen only upto the levels 80 kg/ha during 1984-85. Number of grains/ear and grains weight/ear were affected by nitrogen upto 40 kg N/ha during both the years and number of grains/ear upto 80 kg N/ha during 1983-84 also. 40 & 80 kg N/ha remaining at par gave seeds of significantly higher test weight over control during 1984-85. The highest test weight was noted under 80 kg N/ha. A similar response of wheat to nitrogen application in respect of number of grains per ear, length of the ear was noted by Gupta and Singh (1971). He also noted a reduction in test weight beyond 80 kg N/ha. Singh and Anderson (1975) also reported on the basis of experiments conducted at IARI New Delhi in 1967-68 and 1968-69 that increased levels of nitrogen resulted in promoting yield attributes and grain yield. They also noted a reduction in 1000 grain weight.

A significant increase in grain yield with increasing rates of nitrogen application from 0 to 120 kg/ha was observed during both the years. However the differences between 80 and 120 kg N/ha in 1984-85 year were not significant which might be attributed to residual effect of nitrogen left by Arhar as a preceding crop. This increase in yield may be attributed to the favourable effect of nitrogen on yield attributes like number of fertile spikelets/ear number
of productive tillers and number of grains/ear. These findings are in agreement with those of Agarwal (1972), Daiggar et al. (1976) and Hussain et al. (1976). Agarwal et al. (1979) also recommended on the basis of field experiment conducted during 1975-76 and 1976-77 at crop Research farm Gursarai (Jhansi) that 120 kg N/ha gave significantly higher yield and net profit over 80 kg N/ha. The findings of the present investigation are also in agreement with Borse and Mahajan (1980), Dayanand et al (1980), Kumar and Singh (1980), Reddy et al (1980), Malik (1981) and Dhiman et al (1982).

A significant increase in protein content with each increment in nitrogen dose from 0 to 120 kg/ha was noted during both the years. Similar increase in protein content was also noted by Daiggar et al. (1976) and Patil and Khurpe (1978).

5.3. Nitrogen doses for different time of first irrigation.

A significant interaction between nitrogen levels and time of first irrigation was noted in 1983-84. The data summarized in table 53 indicated that the yield with 120 kg N/ha at 20 or 27 DAS was significantly higher than that obtained with same level of nitrogen under delayed irrigation at 34 and 41 days after sowing and with lower levels of nitrogen under 20 & 27 days startings. The interaction effect for yield attributes were also found to be significant.
5.4 Effect of Seed conditions

Seed condition is of prime importance as regards the late sowing of wheat. Late sowing of wheat results into significant yield reductions. This reduction in yield is due to less time available for vegetative growth as well as reproductive phase. Due to late sowing, time taken for germination gets increased owing to low temperature. Also the growth is of slow order and plants are able to attain their full growth in a comparatively longer period which further reduces the reproductive phase during which seeds are formed as a consequence of storage of photosynthetic material. Because of availability of less time for food storage, seeds remain small in size and of poor shape. To overcome this problem several scientists have worked on this aspect. They found that use of soaked seeds as well as sprouted seed may reduce the decline in yield in late sown wheat. As the water absorption capacity of seeds gets increased, it improves the germination and helps in the quicker establishment of plants. Already sprouted seeds gave the fastest establishment of plants and showed its superiority over dry seed conditions. Seed conditions have been found to have a significant effect on growth as well as yield of the crop during the present course of investigation. Among the three seed conditions (dry, soaked and
sprouted), use of sprouted seeds gave maximum number of plants germinated/m² which is the resultant of already sprouting of seeds. The first step in the germination of a seed is imbibition of water which has already been started during sprouting and thus hastening the germination. Due to early and better germination under this condition, plants also attained a good vegetative growth i.e. more number of shoots/m², more number of functional leaf/shoot, shoot height and fresh and dry weight/shoot. The data on these characters have been presented in tables 66, 73, 70, 74 and 76 respectively.

The data on number of plants germinated/m² have indicated that crop sown with sprouted seeds showed its superiority over crop sown with soaked and dry seeds and that sown with soaked seeds over dry seeds at all the stages during both the years. Consequently almost similar trend was noted in case of number of shoots/m², shoot height and dry weight/shoot.

Once a plant has attained good growth, it will have good yield under normal climatic conditions and with proper plant protection measures. Crop sown with sprouted seed resulted into the highest yield of 33.26 q/ha and 33.89 q/ha during 1983-84 and 1984-85 respectively. These figures were
at par with crop sown with soaked seeds giving yield of 31.48 q/ha and 31.94 q/ha during 1983-84 and 1984-85 respectively and superior to the crop sown with dry seeds during both the years. The superiority of sprouted seed condition may be ascribed to the favourable conditions of yield attributes i.e. number of ears/m², number of grains/ear, 1000 grain weight and grain weight/ear. The data on these attributes have been presented in tables 85, 89 and 95 respectively. The highest number of ears/m² was noted with sprouted seeds during 1983-84 (388.83) and 1984-85 (396.25) which was significantly higher than those with dry and soaked seeds during both the years. A significantly lowest number of ears/m² was noted in dry seeds sown crop (276.50) during 1983-84 and (281.17) during 1984-85.

A similar trend was noted in respect of number of grains/ear, being the highest under sprouted seeds (37.25 during 1983-84 and 38.33 during 1984-85), during both the years. As regards the 1000-grains weight it was the highest under sprouted seed condition being 40.03 g and 40.69 g during 1983-84 and 1984-85 respectively. It was followed by soaked seed condition, being 37.86 g and 38.63 g during the two consecutive years which was significantly lower to that of sprouted seeds and higher to dry seeds.
However grain weight/ear remained statistically unaffected due to seed conditions, though it was of higher order under sprouted seed conditions (1.38 g and 1.42 g during 1983-84 and 1984-85 respectively) followed by soaked (1.30 g and 1.22 g) and then dry seed condition (1.23 g and 1.24 g).

The findings of the present investigation are in agreement with the findings of several workers viz. Shukla and Singh (1972), Kononova (1973), Mosov and Chesnova (1973), Sharma (1975), Mishra and Dwivedi (1980) and Khan and Chatterjee (1981).

5.5. Effect of Varieties.

Varietal differences in relation to their growth and yield are found almost in all the crops. These differences are accounted for their differential genetic make up. Varieties differ in terms of tillering, number of functional leaves and shoot height. These growth characters decide the photosynthesizing area per unit area of land. The more is the photosynthetically active area, the more will be the production of food material which is reserved in storage organs, being grains in case of wheat. Coordinated varietal improvement projects for different crops are being carried out to evolve the most efficient varieties as to utilize the
resources properly. Varieties evolved for the late sowing of wheat are comparatively less in number than those of timely sown wheat. Varieties also show their differential behaviour in different climates because of varying adaptability to climate. Varieties having quick growth and short vegetative growth period are found to be suitable for late sown conditions. Several workers have conducted varietal trials and noted their differential behaviour as regards their growth and yield.

All the varieties included in the present investigation also differed as regards their growth and yielding capacity. Number of plants germinated/m² were found to be significantly maximum in variety HD 2329 followed by HD 2285 and HD 1553 which in turn resulted into the significantly higher number of shoots/m² under the same variety during both the years. The data on number of functional leaves/shoot summarized in table 73 indicated that at maximum tillering and maturity variety HD 2329 gave significantly higher number of functional leaves/shoot than other varieties, however at initial stage the number was higher in variety HD 1553. As a consequence of larger number of functional leaves the variety HD 2329 out yielded others because of higher photosynthetically active area during reproductive phase which accounted for the higher dry matter accumulation and storage of food material.
Variety HD 2329 recorded the highest yield of 32.87 q/ha and 33.57 q/ha during 1983-84 and 1984-85 respectively, whereas the minimum yield of 29.95 q/ha and 30.98 q/ha was noted in variety HD 2285. The higher yield in variety HD 2329 may be ascribed to the higher order of yield attributes, number of ears/m² noted in this variety. However, 1000 grains weight and grain weight/ear were higher in variety HD 1553 but it yielded poorly because of less number of ears/m² noted in this variety. On the other hand the less grain weight/ear is compensated by the higher number of ears/m² in variety HD 2329. Similar varietal differences have been noted by Rayanand et al. (1977), Varma & Rathi (1978), Agarwal et al. (1979) and Lal (1984).

5.6 Seed Conditions for Different Varieties.

A significant interaction between the two factors viz. seed conditions and varieties was noted for some of the yield attributes, however, it was non-significant in case of yield. Significant interaction noted during 1983-84 (Table 86) indicated that in variety HD 1553 sowing of either soaked or sprouted seeds did not result into any marked differences, however in varieties HD 2285 and HD 2329, sowing of sprouted seeds proved to be better than soaked seeds as regards the number of ears/m². A significant interaction was also noted in respect of number/fertile spikelets/ear during 1984-85 which revealed that variety HD 1553 and HD 2329 gave statistically similar number of
fertile spikelets/ear when sowing was done with sprouted seeds, however, under dry seed conditions the later proved to be superior which may be ascribed to the more permeability of seed coat of HD 2329 to imbibe water as to make its earlier establishment, good growth and ultimately the more number of spikelets/ear.

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