

## **1238 Efficacy of fertilizer application in cotton under drip and flood irrigation system**

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Fertilizer application method is one of the important factors in addition to fertilizer dose amongst different agronomic practices, which influence the growth and yield of cotton considerably. Under drip irrigation system, Nitrogen Use Efficiency (NUE) tends to increase if applied through drip system as compared with flood irrigation system. An experiment was conducted at Punjab Agricultural University, Regional Station, Abohar to compare the fertilizer application in two irrigation systems and to find out the optimum fertilizer dose for higher yields under drip irrigation. Field trials comprised of four treatments, *i.e.*, 50% recommended N through drip, 75% N through drip and 100% N in drip and 100% through broadcasting in flood system. In these treatments, the fertilizer through drip was applied in four equal split doses, while in flood irrigation system fertilizer was applied in two equal split doses. Preliminary results in this study showed that 75 % N through drip produced maximum seed cotton yield. Although all the treatments where N was applied through drip produced at par yields but these were significantly higher than the yield produced by 100 % N through flood system. 50% N, 75% N and 100% N through drip produced 15.6, 22.7 and 14.3 per cent higher seed cotton yield over the treatment where recommended dose of N was applied through broadcasting in flood irrigation system. It pertains to the fact that NUE definitely increases when applied through drip in four split doses, which helps in increasing yield levels with lesser amount of fertilizer.

### **Introduction**

Nitrogen fertilizer and irrigation methods are the key factors for yield increase and yield quality improvement. With good management of these two factors, both production and protection can be attained simultaneously. The fertilizer application is one of the major agronomic factors for obtaining good yields. Due to the cultivation of high fertilizer demanding BT cotton on the large areas in Punjab; it is necessary to apply the fertilizer in such a way to increase its efficiency and the effect in producing good yields. Micro-irrigation systems and fertigation -- which is the application of fertilizers through an irrigation system -- have many benefits as they help to control water and nutrients in the root-zone, saving labor and equipment costs. Moreover, with drip irrigation, all nutrients can be applied whenever needed. Thus, keeping in view the above facts, an experiment was conducted to estimate the optimum fertilizer dose, when it is applied through drip system.

### **Material and methods**

An experiment was conducted at Punjab Agricultural University, Regional Station, Abohar to test the efficiency of N fertilizer applied through drip irrigation system as compared to the flood irrigation. The sowing of Bt cotton hybrid MRC 6304 was done in a randomized block design with three replications on 12.5.06. The recommended row to row and plant to plant spacing of 67.5 cm x 75 cm was used. The dose of N fertilizer and the method of application differed as per the treatment. Phosphorus was applied in recommended dose in the form of DAP at the time of sowing. The drip system was laid out with laterals provided in each row of the crop. The Nitrogen was supplied to the crop as recommended in two split doses by

broadcasting in the flood irrigation system, while in the drip system, the N was supplied in four equal split doses through drip system starting with first dose at thinning and the remaining three doses at 15 days interval. The trial comprised of four treatments namely 50% of recommended dose of Nitrogen (RDN) through drip system; 75% RDN through drip; 100% RDN through drip; and 100% RDN through broadcasting in Flood irrigation system. The observations were recorded on plant height, number of bolls per plant, boll weight (g) seed index (g), seed cotton yield and ginning out turn, In addition, Nitrogen Use Efficiency was also calculated. The standard statistical procedures were followed for analyzing the mean data.

## **Results**

The results (Table 1) showed that the growth of cotton in terms of plant height was significantly influenced when the N was applied through drip. 100% RDN in drip recorded maximum plant height but was at par with the treatments 50% RDN and 75% RDN applied through drip system, and significantly higher than the plant height obtained with 100% N applied by broadcasting in flood irrigated cotton crop. This may be due to the fact that N was used efficiently by the crop when applied through drip system as compared to the traditional method of broadcasting.

Also yield characters like boll weight and seed cotton yield per plant were significantly higher in the treatment where 75% of RDN was applied through drip system as compared to the 100% RDN broadcasted in flood irrigation system, while seed cotton yield per plant was non-significant in the three treatments where N was applied though drip system. Even 50% of RDN when applied through drip system produced significantly higher seed cotton yield than the 100% RDN applied by broadcasting in flood irrigation system. GOT was found to have non-significant differences for different treatments. While comparing Nitrogen Use Efficiency (NUE) of different treatments, it was observed that maximum NUE was obtained in the treatment with the lowest amount of supplied N and was significantly higher than all other treatments.

These results suggests that while using drip irrigation system, even 50% of the recommended Nitrogen fertilizer if applied through drip system, can produce higher seed cotton yield as compared to 100% of the Nitrogen applied by broadcasting in flood irrigation system, which is due to the increased nitrogen use efficiency by the crop when the fertilizer is applied in four split doses and that too dissolved in water near the root zone through drip irrigation system.

**Table 1: Effect of dose and method of fertilizer application on growth and yield parameters of cotton**

| <b>Treatments</b>              | <b>Plant stand</b> | <b>Plant height (cm)</b> | <b>Seed index (g)</b> | <b>Boll weight (g)</b> | <b>Bolls/plant</b> | <b>Seed cotton yield/plant</b> | <b>GOT (%)</b> | <b>Seed cotton yield (kg/ha)</b> | <b>Nitrogen Use Efficiency</b> |
|--------------------------------|--------------------|--------------------------|-----------------------|------------------------|--------------------|--------------------------------|----------------|----------------------------------|--------------------------------|
| 50 % RDN through drip          | 90.8               | 150.9                    | 8.75                  | 4.08                   | 44.8               | 211.6                          | 35.23          | 4130                             | 55.07                          |
| 75 % RDN through drip          | 92.8               | 150.4                    | 8.93                  | 4.59                   | 41.4               | 219.5                          | 34.61          | 4385                             | 38.98                          |
| 100 % RDN through drip         | 92.2               | 153.6                    | 8.81                  | 4.41                   | 40.4               | 209.5                          | 34.42          | 4084                             | 27.23                          |
| 100 % RDN through flood system | 86.8               | 127.1                    | 8.49                  | 3.95                   | 40.9               | 181.3                          | 33.34          | 3574                             | 23.82                          |
| <b>CD (5%)</b>                 | <b>NS</b>          | <b>8.2</b>               | <b>NS</b>             | <b>0.43</b>            | <b>NS</b>          | <b>18.7</b>                    | <b>NS</b>      | <b>377</b>                       | <b>3.06</b>                    |
| CV                             | 6.74               | 4.09                     | 6.98                  | 7.40                   | 19.40              | 6.61                           | 4.89           | 6.77                             | 6.12                           |