# IRRIGATION NUMBER AND NITROGEN RATE EFFECTS ON LINT COTTON YIELD

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## Abstract

A field study was conducted in 1997 to investigate the interaction of N rates (0, 40, 80, 120, 160, and 200 kg/ha) and number of postplanting irrigations. The irrigation treatments were two, three and four postplanting irrigations. In all cases the first two postplanting irrigations were applied at 60 and 80 days after planting (dap). The third irrigation was applied at 100 dap and, the fourth one was applied at 120 dap, for the three and four irrigations treatments, respectively. At any water regime there was lint cotton yield response to N rate. Lint yields were similar for the three and four postplanting irrigation treatments and, they outyielded the two postplanting irrigation treatment by 58 %.

## Introduction

Most cotton varieties grown in Mexico have a late growth cycle and high vegetative development, so they require high investments to show their true yield potential. Due to a long life cycle, and growth characteristics of these varieties they use more water and N fertilizer, and require a high number of insecticide applications to protect bolls against the pest damage. All these factors increase the cotton production costs and decrease the growers profits.

The low availability of water for agriculture at the Comarca Lagunera, México make late cotton varieties not the most suitable for this region. This type of varieties need four postlanting irrigations. In order to increase water use efficiency, one of the objectives of the INIFAP cotton breeding program is to develop early varieties, with a compact structure, and low vegetative development. As a result of this program, an early cotton variety, "Laguna 89", was released in 1990. Because of the earliness and plant characteristics of this variety we assume that it will require less water and less N to show its full yield potential.

## Materials and Methods

The "Laguna 89" cotton (*Gossypiun hirsutum* L.) variety was grown in 1997 at the Laguna Experimental Station of Matamoros, Coah., Mexico. The planting date was the 23 of April on 30-inch rows and thinned three weeks later, to a final population density of six plants/$m^2$. Six nitrogen rates (0, 40, 80 120, 160 and 200 kg/ha) were imposed on the three irrigation treatments. All plots received 40 kg/ha of $P_2O_5$. The three irrigation treatments were two, three and four postplanting irrigations. All irrigation treatments received the first two irrigations on the same dates and, they were applied at 60 (first flower stage) and 80 days after planting (dap). The third irrigation was applied at 100 dap and, the fourth one was applied at 120 dap, for the three and four irrigation treatments, respectively. Plots were arranged in a split-plot design with irrigation treatment being the main plot and nitrogen fertilizer rate being the subplot. Main plots were 18 rows wide with four buffer rows between each main plot. Subplots consisted of six rows 10 m long. The main insect pest problem was the silverleaf whitefly, *Bemisia argentifolii* (Bellows and Perring), which was chemically controled using commonly applied pesticides. Seedcotton yields were determined by hand harvesting the center two rows of each subplot. The F-test was considered significant at the $a = 0.05$ level, and means were separated using Fisher´s Least Significant Difference (LSD).

## Results and Discussion

The analysis of variance showed significant differences for lintcotton yields among irrigation treatments, but there were no yield differences among nitrogen fertilizer rates, and there was no irrigation number x nitrogen rates interaction. Lintcotton yields were similar for the three and four posplanting irrigation treatments and, they outyielded the two postplanting irrigation treatment by 58 %, Table 1. At any water regime there was seddcotton yield response to the nitrogen rate applied. Results of this study do not agree with those found by Crowther (1934), Scarsbrook *et al*. (1959), Hearn (1975), and Radin *et al* (1985), who found an interaction of N and water on water use efficiency. Radin *et al*. (1985) results showed that full irrigation increased yields only on high N; on low N, full irrigation did not affect yield but greatly decreased water use efficiency.

The absence of yield response to N fertilization suggested us that residual soil nitrate nitrogen content was high. The nitrogen fertilizer recommendation for cotton at the Comarca Lagunera region is 120 kg/ha but, recent research studies show that new earlier varieties show the highest yields at 80 kg of N/ha (Palomo *et al*., 1997). Abumain (1969), Maples and Frizzell (1985), and Gordon *et al*. (1986) found that a rate of 60 to 100 kg of N/ha is enough to obtain high lint cotton yields. Buscha *et al*. (1992) found that residual nitrogen in the soil dictated the amount of fertilizer needed. For soils with high residuals, a range between 55 to 100 kg per hectare was found to be satisfactory. Results from these investigators agree, in some extent, with our results, and this is very important because they show us that early cotton genotypes could improve water use-efficiency at a lower N rate than late varieties.

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Table 1. Effect of postplanting irrigation number and applied nitrogen on lint cotton yield

| N | Number of irrigation | | | |
|---|---|---|---|---|
| kg/ha | 2 | 3 | 4 | Mean |
| 0 | 1131 | 2052 | 1815 | 1666 |
| 40 | 1070 | 1928 | 1973 | 1657 |
| 80 | 1215 | 2045 | 2085 | 1782 |
| 120 | 1200 | 1829 | 1905 | 1645 |
| 160 | 1082 | 2130 | 2015 | 1742 |
| 200 | 1026 | 1869 | 1926 | 1607 |
| Mean | 1121b | 1975a | 1953a | 1683 |

Means followed by the same letter are not significantly different, LSD (P>0.05)