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Partial Economic Analysis of Cotton for Water Saving and Potential Yield

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Abstract: The field experiment was conducted for partial economic analysis to assess actual and potential seed cotton yields and water savings under 7, 14, and 21 days irrigation intervals. The satisfactory cotton yields appeared at 14-day irrigation interval. Thus, it is recommended that cotton crop should be irrigated with adequate application of water at the interval of 14 days which produces maximum yield and water saving. This saved water could be utilized for cultivating additional area or may be diverted to irrigate the land where scarcity and shortage of the water appears.

Key Words: Cotton-Water Saving-Potential Yield

Introduction

The greatest reduction in yield was more pronounced by increasing the time of irrigation. Welsh, *et al.* (1991) reported that excessive moisture in the root zone affects plant growth, which in turn reduces crop yield. According to Bordovsky and Lyle (1988), highest cotton yield was obtained with irrigation interval of 8 days or less. Raghuwansh and Verma (1991), found that the optimum cotton yield was achieved at an irrigation interval of 10 days. However, Kanber *et al.* (1990) has recommended irrigation interval of 15 days for cotton to get maximum yield. Research reported earlier by Saunders and Gill (1980) have emphasized that the water requirements of cotton crop during the ball formation phase must be met regardless of frequency and depth of irrigation. However, they also reported that the usual interval at the stage of development is between 15 to 21 days depending on soil type and climate. Whereas, Taha *et al.* (1980) reported that maximum seed cotton yield can be obtained if crop's water requirements are properly met during the fruiting phase. Since, all these studies have been conducted with different soil and climatic conditions, thus, these results cannot be applied everywhere. Keeping in view the above varying facts an attempt has been made to determine the effect of different irrigation intervals and conducting partial economic analysis for actual seed cotton yield and potential yield from saved water.

Materials and Methods

The field trial was conducted at Sindh Agriculture University, Tando Jam during 1998 to determine effects of different irrigation intervals on the yields and water savings. Three irrigation intervals i.e. 7, 14, and 21 days were treated in Randomized Complete Block Design, replicated four times. The water depth applied to the crop was measured by using formula given by Isrealson *et al.* (1980).

$$D = \frac{(SMD)\, p_b\, d_r}{y_w\, 100}$$

Where,

D = depth of water required (cm)
SMD = soil moisture deficit (%)
p_b = bulk density (g/cm^3)
y_w = specific weight of water (g/cm^3)
d_r = root depth (cm)

$$SMD = \Theta_f - \Theta_o$$

Where,

Θ_f = Soil moisture at field capacity (%)
Θ_o = Soil moisture at the time of irrigation (%)

Cotton Niab-78 variety was drilled with the incorporation of 125-56-0 kg N-P-K ha^{-1} in the form of Urea and DAP, the full dose of P with half dose of nitrogen was applied at the time of sowing, while remaining N was top dressed at flowering phase. All the cultural practices for crop maintenance were adopted for growth and making area free from insects, pests and diseases.
The additional yield which could be obtained from the saved water was calculated by using the following procedure Ahmed, (1990) and Rashid, (1996).

$$\text{Additional Area} = \frac{100000 \times \text{Water saving}}{\text{Total water applied to 14 \& 21 days irrigation interval}}$$

$$\text{Additional yield} = \frac{\text{Actual yield}}{\text{Total water applied}} \times \text{Water saving}$$

Total yield = Actual yield + Additional yield

Results and Discussion

The irrigation intervals exhibited significant differences for yield and water savings. The partial economic analysis of the experiment showed that 7-day irrigation interval received more amount of water applied in the field in comparison to 14 and 21 days intervals. Water saving over 7-day irrigation interval was higher than 21 days followed by 14 days interval. But, actual seed cotton yield appeared efficiently higher with the application of adequate irrigation at the interval of 14 days. Computed saved water contributed yield of 727 and 511 kg ha^{-1} under 14 and 21 days irrigation intervals respectively. High satisfactory potential yield was observed with the application of 14 days irrigation interval. Thus it is recommended that cotton crop should be irrigated at the interval of 14 days where maximum

actual and potential yields could be obtained and the crop conditions like water stress and water logging will not appear and saved water could effectively be utilized for cultivating additional lands or saved water may be diverted to the water shortage areas.

Table 1: Water saving and additional yield obtained over 7-day irrigation interval

	Irrigation Frequencies		
	7 days	14 days	21 days
Total water applied (cm)	78.5	61.0	55.4
Water saving over 7 days Irrigation interval (cm)	-	17.6	23.1
Saving in water (%)	-	22.4	29.4
Actual yield ($Kg.ha^{-1}$)	1418.0	2516.0	1224.0
Additional yield from saved water ($Kg.ha^{-1}$)	-	727.0	511.0
Total potential yield ($Kg.ha^{-1}$)	1418.0	3243.0	1735.0
Potential yield increase over 7-day irrigation frequencies ($Kg.ha^{-1}$)	-	1825.0	317.0

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