Performance of different genotypes of cotton under increased irrigation interval

Mushtaq Ahmad, Muhammad Aslam, Lal Hussain Akhtar and Ghulam Hussain
Regional Agricultural Research Institute, Bahawalpur, Punjab PAKISTAN
Correspondence author wahab888@hotmail.com

ABSTRACT

Response of irrigation intervals on yield, yield components and fiber characteristics of different cotton genotypes was studied at Regional Agricultural Research Institute, Bahawalpur during the years 1999-2000 and 2000-2001. The new strain VH-137 performed better compared to other genotypes in terms of yield and yield components and was least affected by an increase in irrigation intervals. Although boll weight of BH-95 remained highest when irrigation interval was kept two weeks, it could not maintained boll size when irrigation interval was increased.

Introduction

Pakistan has been suffering form severe drought since 1998. This drought has reduced the area under economic crops like cotton and wheat resulting in decreased yields per unit area. The resulting decline in agricultural production has had a significant impact on Pakistan's economy. Last season's (2001) severe drought adversely affected agricultural growth which went into negative 2.5% against the targeted growth of 3.9% and previous year's positive 6.1%. The over all shortage of irrigation water level at Mangla and Tarbela dams, the main sources of water for irrigation, remained below normal (Anonymous, 2002). Due to drastic shortage of irrigation water, increase in prices of inputs like fertilizer, insecticides, herbicides and diesel oil etc. has reduced the net return of each farmer and total cotton production of the country.

McConnell *et al.* (1999) found that the fiber properties were inconsistently affected by irrigation. Luz *et al*. (1998) reported that the seed cotton yields were greater in irrigated conditions than those obtained with water stress at flowering. Sarwar and Qureshi (1999) observed that water stress during flowering and boll formation stages significantly decreased seed cotton yield. The present studies were designed to determine the effect of increased irrigation interval on the yield, yield components and fiber characteristics of various cotton varieties/strains and to identify the strains tolerant to shortage of irrigation water with an objective of including better types in future hybridisation programs.

Experimental procedure

This study was conducted at Regional Agricultural Research Institute, Bahawalpur during 1999-2000 and 2000-2001. Three irrigation intervals (at 2 weeks, 3 weeks, 4 weeks after first irrigation) and four cotton genotypes (CIM-448, BH-95, VH-53 and VH-137) were studied in a split plot design trial with three replications. Net plot size was 3 m x 7 m. All phosphorous in the form of days after planting (DAP) and potash in form of sulphate of potash (SOP) were applied as basal dose at sowing while all nitrogen in the form of Urea was applied at flowering. Cotton was sown during both years on a well-prepared seedbed with single row hand drill in rows 75 cm apart. All the agronomic practices were kept normal and uniform in all the treatments. Data were recorded on number of bolls per plant, boll weight, seed cotton yield, ginning out turn (%), staple length (mm), strength, and micronaire. The data collected were analysed statistically by using Fisher's analysis of variance technique and differences among the treatments were compared by LSD at 5% probability level.

Results and Discussion

The new strain VH-137 produced significantly higher boll production compared to other strains. Increase in irrigation interval resulted in less number of bolls compared to 2 weeks interval in all genotypes (Table 1).

BH-95 showed significantly higher boll weight when irrigation was applied at two and three weeks interval compared to other genotypes (Table 2).

The seed cotton yield of VH-137 was higher than all the other genotypes in all the three intervals (Table 3). The yield of all strains significantly decreased by increasing in irrigation intervals, but that of VH-53 decreased to a greater extent, with a 34% reduction for 4 week intervals compared with other genotypes which averaged only 18% reduction. VH-137 had the least reduction of 14% and has been included in breeding to exploit its high yield potential and possible stress tolerance. The present results support the findings of Luz *et al*. (1998), Sarwar and Qureshi (1999) and Vories and McConnell (1998) who reported a decline in seed cotton yield due to moisture stress at various stages of growth.

No genotype differences were found in ginning out turn (%) and staple length while increasing the interval of irrigation resulted in decreased GOT% (Tables 4 and 5) while staple length remained unaffected. Data on strength and micronaire revealed that even the increase in irrigation intervals did not adversely affect the strength and micronaire of any of the genotypes studied (Table 6 and 7).

References

- Anonymous, 2002. *Agriculture: Economic Bulletin of National Bank of Pakistan*, 29: 19.
- Luz., M.J, Da, S.E., Bezerra, J.R.C., Barreto, A.N., Dos Santos, J.W., Amorim Neto, M. and Da, S. (1998). Response of irrigated herbaceous cotton to water stress. I. yield and yield components. *Comunicado Tecnico-Embrapa Algodao*, 82, 5pp.
- McConnell, J.S., Vories, E.D., Oosterhuis, D.M. and

Baker, W.H. (1999). Effect of irrigation termination on the yield, earliness, and fiber qualities of cotton. *Journal of Production Agriculture*, 12: 263-268.

- Sarwar, A. and Qureshi, A.S. (1999). Genetic response of cotton (*Gossypium hirsutum* L.) to various irrigation regimes. *Sarhad Journal of Agriculture*, **15**: 17-20.
- Steel, R.G.D. and Torrie, J.H. (1984). Principles and Procedures of Statistics, 2nd Ed. McGraw Hill Book Co Inc Singapore. p 172-177.
- Vories, E.D. and McConnell, J.S. (1998). Irrigation management and water use of cotton in Arkansas production. *Special Report Arkansas Agricultural Experimental Station*, **188**: 128-130.

Table 1. *Number of bolls per plant.*

Varieties/strains	I_1 (2 weeks irrigation interval)	I_2 (3 weeks irrigation interval)	I_3 (4 weeks irrigation interval)
CIM-448	?	?	?
BH-95	20.4	21.4	17.3
VH-53	23.2	18.4	18.1
VH-137	31.7	29.6	27.1
LSD for I	1.81		
LSD for V	2.4		
LSD for V x I	2.8		

Table 2. *Boll weight (gram).*

Varieties/strains	I_1 (2 weeks irrigation interval)	I_2 (3 weeks irrigation interval)	I_3 (4 weeks irrigation interval)
CIM-448	3.3	3.2	2.7
BH-95	3.8	3.7	3.2
VH-53	3.6	3.5	2.5
VH-137	3.5	3.7	3.5
LSD for I x V	0.35		

Table 3. *Seed cotton yield (kg ha^{-1}).*

Varieties/strains	I_1 (2 weeks irrigation interval)	I_2 (3 weeks irrigation interval)	I_3 (4 weeks irrigation interval)
CIM-448	2412	2273	1950
BH-95	2651	2416	2095
VH-53	2349	1917	1538
VH-137	3055	2948	2635
LSD for irrigation	154.3		
LSD for varieties	147.0		
LSD for I x V	188.0		

Table 4. *Ginning out turn (%).*

Varieties/strains	I_1 (2 weeks irrigation interval)	I_2 (3 weeks irrigation interval)	I_3 (4 weeks irrigation interval)
CIM-448	43.5	40.0	40.1
BH-95	38.3	36.7	38.5
VH-53	37.1	38.0	39.0
VH-137	37.3	36.5	35.8

Table 5. *Staple length (mm).*

Varieties/strains	I_1 (2 weeks irrigation interval)	I_2 (3 weeks irrigation interval)	I_3 (4 weeks irrigation interval)
CIM-448	29.0	29.5	29
BH-95	26.8	27.5	27.5
VH-53	28.5	28.8	26.8
VH-137	27.0	27.3	27.3

Table 6. *Strength (Tppsi).*

Varieties/strains	I_1 (2 weeks irrigation interval)	I_2 (3 weeks irrigation interval)	I_3 (4 weeks irrigation interval)
CIM-448	93.8	92.3	92.0
BH-95	93.4	92.8	93.0
VH-53	93.9	95.3	95.4
VH-137	94.3	93.4	94.2

Table 7. *Micronaire (mg/inch^2).*

Varieties/strains	I_1 (2 weeks irrigation interval)	I_2 (3 weeks irrigation interval)	I_3 (4 weeks irrigation interval)
CIM-448	4.1	4.5	4.4
BH-95	4.9	4.8	4.9
VH-53	4.3	4.5	4.9
VH-137	5.2	5.3	5.3