3   **2**   ***1**

.

)   (   )

. (

.

300

.

300   (P<   %5)

.

.

.

.

600   704

.

:

Investigation of Water Deficit Stress Effects on Yield and Yield Components Using Path Analysis in Some Corn Hybrids

SM Shoae Hosseini[1]*, M Farsi[2], S Khavari Khorasani[3]

[1]Dept of Agronomy and Plant Breeding, Faculty of Agriculture, Ferdosi University of Mashhad, Mashhad, Iran
[2]Research Center of Agriculture, Khorasan Razavi Province, Mashhad, Iran
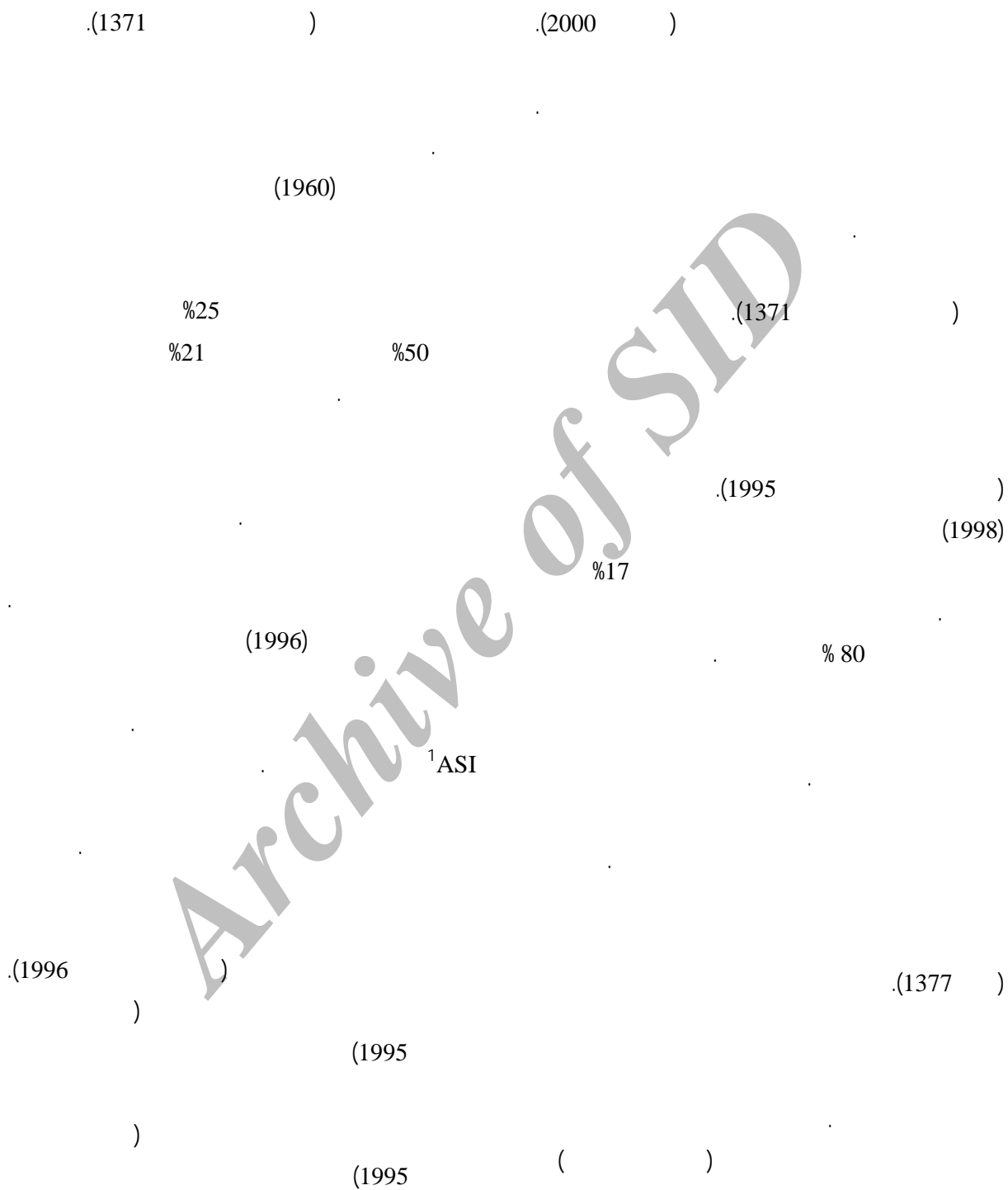[3]Khorasan Economic and Financial Affaires Organization, Mashhad, Iran
*Corresponding author: E-mail:m_msh8479@yahoo.com

Abstract

This experiment was conducted to study the effects of water deficit stress on yield and yield components in eight corn hybrids. The experiment was laid out in split plot using randomized complete block design with three replications. Treatments consisted of two irrigation levels (in stress condition and without stress) as main plots, and eight corn hybrids (six late maturing single crosses and two three- way cross with moderate maturity) as sub-plots. Yield was significantly affected by water stress ($p \leq \%5$). Other measured traits were also negatively affected, but not significantly. Hybrids showed significant differences for plant height, stem diameter, number of rows per ear, cob diameter, ear length, number of grain per row, total leaf number, number of leaves above the main ear and plant height up to position of ear emergence ($p \leq \%5$). Results of stepwise regression and path analysis revealed that in the non-stress condition, selection for increased yield could be performed by selecting genotypes with high percentage of cob, kernel length, number of grain per row, plant height and ear length. In the stress condition, cob diameter, number of grain per row and ear length could be used as components for selection of high yielding genotypes. Among indices used for screening of genotypes to drought stress, tolerance index could differentiate among tolerant and intolerant genotypes. For the selection of high yielding genotypes in water stress conditions, in addition to tolerance indices, other important agronomical characteristics should be considered. Based on results of this experiment Single Cross 704 and Three Way Cross 600 were recommended for normal and water stress conditions, respectively.

Key Words: Corn hybrid, Path analysis, Stepwise regression, Tolerance indices, Water deficit stress, Yield

(*Zea maye*s L.)

.(1371   )   .(2000   )

.

.

(1960)

.

%25   .(1371   )
%21   %50

.

.(1995   )
(1998)

%17

.   .

(1996)   % 80

.

.   ¹ASI   .

.   .

.(1996   )   .(1377   )
)

(1995

)   .

(1995   (   )

.

.

.(1987   )

.

(1378)

.

(1376)

.(1376   )

.

(1378)   .

.

.

1

(1978   ) (SSI)[1]

3

(1992   ) (STI)[2]

1379

) (MP) [4]   (TOL)

.   (1981

(

)

(

(T.W.C 605 ,T.W.C 600 ,SC 720 ,SC 709

. ,SC 704 ,SC 703 ,SC 701 ,SC 700)

75   7

[1]Stress susceptibility index
[2]Stress tolerance index
[3]Stress tolerance
[4]Mean productivity

[1]Split Plot

0 60   20/5

                                                                    5– 7

.   .

(6 7)

.

                                                                         300

10   400

:   .

                                                                    .

                                                          10 12   7 9

.   300   .

:   .

                                                    .

                                              –

=

(STI)   (1978)
(1992)

:   )
                                              .(1984
$$GMP = \sqrt{(Y_S)(Y_P)}$$

$$MP = \frac{Y_P + Y_s}{2}$$

$$SSI = \frac{[1 - (Y_s / Y_p)]}{SI}$$

$$SI = [1 - (Y_{\bar{s}} / Y_{\bar{p}})]$$

$$STI = (\frac{Y_p}{Y_{\bar{p}}}) \times (\frac{Y_s}{Y_{\bar{s}}}) \times (\frac{Y_{\bar{s}}}{Y_{\bar{p}}}) = \frac{(Y_p^s)(Y_s^p)}{(Y_p^-)^2}$$.

                                                               (TOL)

                    Y_S (MP)

Y_S^- Y_P (1981)

                                                               (SSI)

$$Y^-_P$$

.

.

2122   (%27/66)

.(1   )

300   .(2   )

.

− 2

2/7	2/41	2/47	(cm)
7/51	164/8	178/2	(cm)
12/21	91/56	104/3	(cm)
14/23	13/08	11/45	
0/9	5/58	5/53	
4/81	15/43	16/21	(cm)
3/25	4/76	4/92	(cm)
5/97	17/3	18/4	
6/4	34/8	37/18	
6/92	14/36	13/43	
2/34	2/58	2/64	(cm)
3/51	1/09	1/13	(cm)
7/22	71/43	76/99	300 (gr)
27/66	5547	7669	(kg/ha)

3

( )		
15/69	11/564	
48/30	0/015	
79/72	5/411	
56/05	7/696	
72/36	0/118	
10/09	0/181	
39/93	1/436	
67/94	0/055	
7/85	0/019	
21/05	0/051	
38/74	20/803	
19/62	0/010	
20/42	17/044	300
4/44	69210/6	

x_7 x_6 = x_5

.   300   (%25/88)

.   0/7616   2   .   (%3/92)

0/914

0/326   .

0/22

.   .

7

.

$Y=198.6 + 3636.2 X1$:   300

0/2447 $Y= 4195.5$ $4511.5 X1 + 160.4 X2$ 69.5

$X3$ $1863 X4+ 105.1 X5+ 4969.3 X6- 75.2 X7$

= x_2 =x_1

.   = x_4 = x_3

%67/9 %72/4

.(3)

0/41 0/45

.

0/533

(2) (%27/66) . 0/763

.(4) 1/3

(%12/21)

(%7/231) 300 (%7/51)) (p ≤ 0/05)

(%6/401) .(5

. (1378) 0/292

0/99

0/10)

( ) .(5) (p ≤

1/53

. 1/13

(0/533)

0/763

. 0/517

1/3

)

. .(5)

(%7/221) 300

.

) STI GMP

(- .

.(7)

.

(%79/7)

. (%4/4)

.

(1376) (1378) .

6

(SSI)

(1378)

704 (1378) (1376)

.

-

(1378) (1377) .

.

.

. (1378) (1376)

(Y_s) (Y_p)

.

704

.

(%1)

. 6

(%5)

(%10) (MP)

600 (5) .

(TOL)

600 704

. .

.

.

.(3   )

.

.1378

.

.1376

.

.1378

.1371

.1377

.77/213

Anonymous, 2000. Agricultural statistics of Pakistan. Government of Pakistan, Ministry of Food, Agriculture and Livestock, Economic Wing, Islamabad, P. 104.

Denmend OT and Shaw RH, 1960. The effects of soil moisture stress at different stage of growth on the development and yield of corn. Agron J 52: 272-274.

Edmeades GO, Bolanos J, Bänziger M, Chapman SC and Ortega A, 1998. Developing drought and low-nitrogen tolerant. Maize Symposium Abstracts. Dept. Agriculture, University of Queensland, Brisbane 4072. Australia.

Edmeades GO, Bolanos J, Bänziger M and Elings A, 1996. Genetic in provment increases efficiency of water and nitrogen use in tropical maize. (CIMMYT). Mexico.

Fernandez GCJ, 1992. Effective selection criteria for assessing plant stress tolerance. P 257-270. In: Kuo CG (ed.) Adaptation of food crops to temperature and water stress. Proceedings of International Symposium, Taiwan.

Fischer RA and Maurer R, 1978. Drought resistance in spring wheat cultivar. Grain yield responses. Aust J Agr 29: 897-917.

Gomez KA and Gomez AA, 1984. Statistical procedures for agricultural research(2nd ed.). John Wiley and Sons.

Magrokosho C and Pixley K, 1995. Drought tolerance at flowering and cross-over interaction for yield of three maize of Zimbabwe. CIMMYT. Mount pleasant. Harare, Zimbawe.

Osmanzia M, Rajaram S and Knapp EB, 1987. Breeding for moisture stressed area In: Srivastara et al (eds.). Drought tolerance in winter Cereal. John Wiley and Sons, New York Pp: 157-161.

Rossiel AA and Hamblin J, 1981. Theoretical aspects of selection for yield in stress and non stress environments Crop Sci 21: 943-946.