Egypt. J. Agro. **Vol. 40.**, No. 1, pp. 45 - 58 (2018)

Effect of Drought Stress on Yield and Yield Components of 20 Peanut Genotypes Grown under Newly Reclaimed Soil

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THIS INVESTIGATION was carried out to evaluate the performance of some yield characteristics for twenty peanut genotypes of different origins under two irrigation treatments. The experiment was conducted during the two successive seasons 2015 and 2016 at the Experimental Station of Desert Research Center, Toshka, Egypt. Losses in peanut line yield and yield component are maximized at drought treatment. The main objective of this investigation was to study the effects of deficit irrigation (I) in genotype (G) and G × I interaction on yield component and yield traits in peanut genotypes. A split plot design was used, where the irrigations were allotted to two irrigation treatments, i.e. well watering by giving all recommended irrigations (3500 m^3/fad) and water stress by giving 67% from recommended irrigations (2345m^3/fad), while sub plots were allotted to genotypes. Water stress caused a significant decrease in pod yield/ha, pod yield/plant, seed weight/plant, no. of pod/plant, no. of seed/pod and 100 seed. The rank of genotypes for studied traits under water stress was changed from that under well watering conditions. The peanut lines L11 and L17 were the highest values for pod yield/plant and other studied traits, L11 for seed weight/plant and number of seeds/plant, and L3 for 100 seed weight.

Keywords: Groundnut, drought stress, Tolerance index, Genotype×irrigation interaction, Reclaimed soil.

Introduction

Water deficit stress is one of the major environmental constraints limiting agricultural productivity and plays a major role in the distribution of plant species across different types of environments (Ashraf, 2010). Two-thirds of the potential yields of major crops are usually lost due to adverse growing environments (Chaves et al., 2009). Drought or water deficit condition can be defined as the absence of adequate moisture necessary for normal plants to grow and complete their life cycle (Zhu, 2002).

Knowledge on the performance and adaptability of genotypes to particular environments is fundamental to estimate the agronomical value of cultivars and for their recommendation for specific environments (Murakami et al., 2004).

Peanut (*Arachis hypogaea* L.) is the world's 4th most important edible oil crop and 3rd most important source of vegetable protein (CGIAR, 2005). However, over 97.6% of world peanut area and about 95.5% of total production is concentrated in developing predominantly in Asia and Africa, where crop is grown mostly under rain-fed conditions (ICRISAT, 2011). In these regions, low rainfall and prolonged dry spells during crop growth period are main reason for low yields and constraint to peanut production (Kumar, 2007).

Peanut is an important legume crop grown in tropical and sub-tropical semi-arid regions of the world; the yield level is severely affected by shortage of soil moisture. Peanut (*Arachis hypogaea* L.) is an important seed legume in Egypt as compared with other oil crops. It is considered as the most popular oil seed in the world, following soy, cotton and canola (Arruda et al., 2015). This crop is adapted to tropical and semiarid regions

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DOI: 110.21608/agro.2018.2275.1088

(Pereiral et al., 2015). Peanut is mainly used for human consumption and oil production as it has a valuable commercial oil 40-60%, in addition to high protein content (16-28%). The level of damage caused by water stress is determined by plant growth stage, intensity and duration of the stress. Water deficit during flowering and seed development has sever effect on the pod and seed yield as compared with other growth stages. Therefore, resistance to drought is a very desired trait in breeding programs (Perierel et al., 2015).

The overall objective of the present research was to select genotypes with high tolerance to intermittent drought. This effort included the following steps: (i) To determine the effects of drought stress on yield component and yield, (ii) To estimate the effects of peanut genotype and genotype×irrigation interaction on such traits, (iii) Classify studied genotypes based on efficiency vs responsiveness, yielding ability vs drought tolerance.

Materials and Methods

This study was carried out at Toshka Station, Desert Research Center, Aswan, Egypt, 2015 and 2016 seasons.

Experimental design

Four field evaluation experiments were carried out in 2015 and 2016 seasons at Toshka Station, Desert Research Center, Aswan, Egypt, and two drought stress levels. Drip irrigation system was applied in these experiments using drippers every day. The drought stress levels were the normal condition (100% of field capacity (3500 m^3/fad) and the drought stress (67% of normal condition (2345 m^3/fad), Each experiment contained 20 genotypes (Table 1) designed in a randomized complete block design with three replicates. Each genotype was allotted in two rows plot of 10 m long and 60 cm apart with 30 cm between hills (one plant per hill). The preceding crops were wheat and faba been in the first and second seasons, respectively.

TABLE 1. The origin of the used genotypes.

No.	Entry	Origin	No.	Entry	Origin
1	Line 25	Israel	11	Line 13	Zambia
2	Line 35	China	12	Line 3	Brazil
3	Line 34	China	13	Line 4	Brazil
4	Line 50	Mexico	14	Line 41	China
5	Line 27r	Israel	15	Line 18	Israel
6	Line 28	Israel	16	Line 43	China
7	Line 26	Israel	17	Line 8	Malawi
8	Line 27	Israel	18	Line 6	Brazil
9	Line 9	Malawi	19	G 13	Egypt
10	Line 10	Malawi	20	NC (Cheek)	USA

Agriculture practices

Planting was done in the two summer seasons at 14th and 5th of April in 2015 and 2016, respectively. All other cultural practices were done according to the slandered recommendations for sowing peanut in Toshka station.

Soil type of experimental site

The soil analysis of the experimental soil at the Experimental Station of Desert Research Center, Toshka, Egypt, as an average of the two growing seasons 2015 and 2016 (Table 2).

The climatic of experiment in Toskha

The climatic differences over experimental years are shown in Table 3.

TABLE 2. Some physical and chemical properties of experimental sites.

Sand (%)	Silt (%)	Clay (%)	Texture	pH	EC (dS/m)	Organic matter (%)	$CaCO_3$ (%)	Cations (me/l)				Anions (me/l)			
								Ca^{++}	Mg^{++}	K^+	Na^+	Cl^{--}	CO_3^{--}	HCO_3^-	SO_4^{--}
92.52	2.22	5.26	Sandy	7.53	16.59	0.24	4.51	42	24	0.17	207	67.5	0	11.2	144.3

TABLE 3. Minimum, maximum and mean daily temperature at Toshka.

Month		2015			2016		
		Min.	Max.	Mean	Min.	Max.	Mean
April	1-15	15.24	31.27	23.25	18.61	36.75	27.68
	16-30	17.03	35.25	26.14	19.90	39.41	29.65
	Mean	16.14	33.26	24.70	19.25	38.08	28.67
May	1-15	21.97	37.49	29.73	22.81	41.09	31.95
	16-31	23.44	40.07	31.75	24.20	40.65	32.43
	Mean	22.70	38.78	30.74	23.50	40.87	32.19
June	1-15	25.89	41.19	33.54	26.20	44.38	35.29
	16-30	24.47	39.53	32.00	25.49	42.55	34.02
	Mean	25.18	40.36	32.77	25.85	43.47	34.66
July	1-15	23.90	39.63	31.77	25.55	42.22	33.88
	16-31	24.25	42.76	33.50	27.38	41.74	34.56
	Mean	24.08	41.19	32.63	26.46	41.98	34.22
August	1-15	29.18	44.70	36.94	27.38	42.53	34.96
	16-31	29.11	43.40	36.25	25.56	41.34	33.45
	Mean	29.14	44.05	36.60	26.47	41.94	34.20
September	1-15	26.10	42.30	34.20	24.99	40.70	32.85
	16-30	27.27	42.27	34.77	24.28	39.44	31.86
	Mean	26.68	42.29	34.49	24.64	40.07	32.35

Characteristics measurements

After maturity, a random sample of ten plants from each unit was taken to determine pod yield/plant, seed weight/plant, number of pods/plant, number of seeds/plant and 100 seed weight. To determine seed yield/unit, each experimental unit was harvested and weighted and converted to ton/ha.

Statistical analysis

Data were analyzed by SAS software package. Separate analysis of variance using randomized complete block design was carried out for each year and each condition level. Bartlet's test for variance homogeneity was exerted following Snedecor & Cochran (1983), and combined analysis for data from each year and each environment level according to Gomez &| Gomez (1984). Means were compared by Revised Least Significant Difference (LSD) at 5% level of significant (Steel & Torrie, 1981).

Results and Discussions

Analysis of variance

Combined analysis of variance across years (2015 and 2016) for studied yield and yield component traits of 20 peanut genotypes under two irrigation regimes using a split plot design is presented in Table 4. The variances due to years for pod yield/ha, pod yield/plant, seed weight/plant, pod number/plant and seed number/plant weight were highly significant except for 100 seed was not-significant, indicating that years differ significantly for these traits and that the environmental conditions prevailed in the two seasons (weather and soil conditions) were different to the extent that affected all studied traits by years.

The variances due to irrigation treatments for the six studied yield traits, were significant ($p \leq 0.01$), indicating that water stress had a significant effect on these traits.

The main effects of genotypes were significant ($p \leq 0.01$) for all studied traits, indicating that studied genotypes exhibited significant differences in all studied yield characters. It is observed that genotype effects were more pronounced than irrigation effects on all studied traits (Table 4).

Mean squares due to irrigation×years, genotype ×years, genotype×irrigations and genotype ×irrigations×years were significant ($p \leq 0.05$ or 0.01) for all studied traits, suggesting that rank of genotypes is different from year to year, from one irrigation regime to another and from one combination of irrigation×year to another, except irrigation×years 100-seed weight was non-significant and genotype×irrigations×years were non-significant for seed number/plant and 100-seed weight.

TABLE 4. Mean squares from the combined ANOVA for pod yield/ha, pod yield/plant, seed weight/plant, no. of pod/plant, no. of seed/pod and 100 seed weight under two water levels of 20 genotypes in 2015 and 2016 seasons.

S.O.V.	DF	Pod yield ha^{-1}	Pod yield plant^{-1}	Seed weight plant^{-1}	Pod No. plant^{-1}	Seed No. plant^{-1}	100 seed weight
Year (Y)	1	142.47**	61937.0**	19169.2**	15280.1**	56478.8**	7.91
Irri. (I)	1	276.69**	89919.5**	32352.4**	26818.2**	25172.0**	11626.68**
Y×I	1	5.659**	2538.3**	1048.8**	717.6**	509.5*	0.17
Error (a)	8	0.25	84.5	9.7	66.0	72.4	16.95
Genotype (G)	19	25.66**	8417.5**	2125.8**	2760.2**	5247.3**	552.44**
Y×G	19	3.02**	1121.9**	346.1**	378.7**	834.7**	15.86**
I×G	19	1.97**	647.4**	262.1**	248.7**	164.4**	70.80**
Y×I×G	19	0.35**	122.5**	48.7**	46.7**	39.2	3.88
Error (b)	152	0.07	24.2	8.7	11.8	24.9	5.06

* and **: significant at 0.05 and 0.01 levels of probability, respectively.

Significance of main effects of peanut genotypes, irrigation treatments and their interactions of the present study confirms the findings of pervious investigators; i.e. Clavel et al. (2006) and Jongrungklang et al. (2012) for genotypes, Arunyanark et al., (2009), Dinh et al. (2013) and Arruda et al. (2015) for irrigation regimes and Girdthai et al. (2010) and Arunachalam & Kannan (2013) for genotype×irrigation interaction.

Moreover, significant interaction between genotypes and irrigation treatments indicated that selection is possible to be practiced under a specific irrigation treatment (Jongrungklang et al., 2008; Girdthai et al., 2010; Arunachalam & Kannan, 2013 and Pereiral et al., 2015).

Effect of peanut genotype

In general, lines varied significantly in all studied traits (Table 5). High values of all studied traits were considered favorable. The line L17 showed the highest (most favorable) means for pod yield/ha, pod yield/plant, seed weight/plant, pod number/plant, 100-seed weight and seed number/plant weight and superiority. The lines L11, L13, L14 and L19 ranked second, third, fourth and fifth, respectively for the same traits except for 100-seed weight. For 100-seed weight, the lines L3, L18 and L16, respectively came in the first rank and showed the highest means for this trait. These lines showed significant increase more than the check line L20 (NC).

On the contrary, the linesL1 and L5 showed the lowest means for pod yield/ha (ton), pod yield/plant (g). For seed weight/plant and 100 seed weight, the line L4 showed the lowest mean for these traits. For no. of pod/plant and no. of seed/plant the line L3 came in the last rank and achieved the lowest means among all lines for these trait in this study.

This result indicated that it is possible to obtain a high yielding and high yield component simultaneously, in spite of the positive correlation mentioned in the review between grain yield and yield component, confirming the results of Pimratch et al. (2008a). High pod yield was recorded in some peanut genotypes (Puangbut et al., 2009 and 2011)

Genotypic variation in peanut yield traits was reported by several investigators (Rucker et al., 1995; Pimratch et al., 2008a; Pimratch et al., 2010 and Pereiral et al., 2015). The existence of genetic variability for yield traits indicates that these traits of peanut could be improved by conventional breeding programs.

Peanut lines×irrigation regime interaction:

Means of each peanut line and check line for studied seed yield and yield traits under contrasting irrigation regimes, i.e. well watering and water stress across two years are presented in Table 6. The highest mean for pod yield per hectare, pod yield per plant, seed weight per plant and pod per plant was recorded for the peanut line L11 followed by L17 and L19 and for 100 seed weight for peanut line L18 and L3 and for no. of seed per plant for the peanut line L19, L14 and L11 under both irrigation regimes, while the lowest ones for pod yield per hectare and pod yield per plant were exhibited by L1, for seed weight per plant and 100 seed weight for line L4, for no. of pod per plant and no of seed per plant for line L3.

TABLE 5. Means of studied grain component and yield traits of 20 genotypes peanut across two irrigation regimes combined across 2015 and 2016 seasons.

Genotype	Pod yield ha^{-1} (ton)	Pod yield/ plant (g)	Seed weight/ plant (g)	No. of pod/ plant	100 seed weight	No. of seeds/ plant
L1	2.92	52.54	33.28	42.58	53.09	62.03
L2	4.22	76.17	42.34	48.17	54.87	76.97
L3	3.35	60.42	33.84	32.08	70.5	47.6
L4	3.27	58.75	25.89	41.08	44.58	57.83
L5	3.13	56.29	34.03	48	46.07	72.9
L6	3.85	69.38	39.25	43.75	56.32	68.48
L7	4.37	78.75	41.95	46.58	59.78	69.39
L8	3.76	67.79	37.33	50.08	49.31	75.48
L9	3.35	60.33	31.58	37.08	61.52	50.72
L10	5.07	91.38	43.23	56.42	50.9	84
L11	7.59	137.04	71.24	81.5	54.55	127.93
L12	5.52	99.63	51.92	55.75	61.93	82.16
L13	6.52	117.67	60.18	66.08	59.65	98.61
L14	6.5	117.33	61.09	77.75	55.46	108.49
L15	4.52	81.42	45.98	51.92	57.22	79.93
L16	4.88	88	49.76	54.42	65.44	74.89
L17	7.64	137.96	68.35	85.25	63.92	104.23
L18	5.02	90.54	48.7	51.67	67.29	71.21
L19	6.49	117.17	68.61	77.67	60.64	111.58
L20(Check)	4.57	82.33	42.13	46.92	58.73	70.08
Average	4.83	87.04	46.53	54.74	57.59	79.72
LSD0.05	0.18	3.29	1.97	2.3	3.34	1.51
LSD0.01	0.26	4.68	2.81	3.27	4.75	2.14

TABLE 6. Means of studied yield components and yield traits of each peanut line under two water regimes and change (%) across two seasons.

Genotypes	WW	WS	Ch%	WW	WS	Ch%
	Pod yield ha-1(PYPH)			pod yield/plant (g)(PYPP)		
L1	3.60	2.24	-60.77**	64.75	40.33	-60.54**
L2	5.00	3.45	-45.13**	90.25	62.08	-45.37**
L3	4.01	2.70	-48.87**	72.25	48.58	-48.71**
L4	3.85	2.69	-42.93**	69.17	48.33	-43.10**
L5	3.90	2.36	-65.58**	70.17	42.42	-65.42**
L6	4.79	2.91	-64.48**	86.25	52.50	-64.29**
L7	5.53	3.21	-71.90**	99.50	58.00	-71.55**
L8	4.53	2.99	-51.36**	81.58	54.00	-51.08**
L9	3.83	2.88	-32.85**	68.83	51.83	-32.80**
L10	6.14	4.00	-53.71**	110.67	72.08	-53.53**
L11	9.29	5.90	-57.47**	167.58	106.50	-57.36**
L12	6.57	4.47	-47.03**	118.58	80.67	-47.00**
L13	8.06	4.99	-61.51**	145.25	90.08	-61.24**
L14	8.06	4.94	-63.20**	145.50	89.17	-63.18**
L15	5.48	3.57	-53.52**	98.67	64.17	-53.77**
L16	5.95	3.81	-56.37**	107.33	68.67	-56.31**
L17	9.54	5.73	-66.42**	172.42	103.50	-66.59**
L18	6.03	4.00	-50.89**	108.92	72.17	-50.92**
L19	8.15	4.82	-69.02**	147.33	87.00	-69.35**
L20	5.71	3.42	-67.04**	103.00	61.67	-67.03**
Average	5.90	3.75	-56.50**	106.40	67.69	-56.46**
$LSD_{0.05}$		G=0.18, G×I=0.25,I=0.06			G=3.29, G×I=4.66,I=1.04	
$LSD_{0.01}$		G=0.25, G×I=0.36,I=0.08			G=4.68, G×I=6.62,I=1.48	

TABLE 6. Cont.

Genotypes	WW	WS	Ch%	WW	WS	Ch%
		Pod yield ha-1(PYPH)			**pod yield/plant (g)(PYPP)**	
		seed weight/plant (g)(SWPP)			**no. of pod/plant(PPP)**	
L1	41.23	25.32	-62.87**	49.50	35.67	-38.79**
L2	49.68	35.00	-41.95**	55.67	40.67	-36.89**
L3	41.02	26.67	-53.81**	37.00	27.17	-36.20**
L4	31.05	20.73	-49.76**	45.83	36.33	-26.15**
L5	41.00	27.05	-51.57**	56.50	39.50	-43.04**
L6	49.08	29.42	-66.86**	53.33	34.17	-56.10**
L7	51.35	32.55	-57.76**	55.50	37.67	-47.35**
L8	46.30	28.37	-63.22**	58.83	41.33	-42.34**
L9	38.18	24.97	-52.94**	42.17	32.00	-31.77**
L10	53.55	32.92	-62.68**	69.00	43.83	-57.41**
L11	90.42	52.07	-73.66**	101.17	61.83	-63.61**
L12	65.62	38.22	-71.70**	68.33	43.17	-58.30**
L13	76.63	43.72	-75.30**	82.67	49.50	-67.00**
L14	76.62	45.57	-68.14**	95.00	60.50	-57.02**
L15	54.77	37.20	-47.22**	60.67	43.17	-40.54**
L16	62.80	36.72	-71.04**	62.00	46.83	-32.38**
L17	89.20	47.50	-87.79**	103.50	67.00	-54.48**
L18	61.83	35.57	-73.85**	59.50	43.83	-35.74**
L19	87.97	49.25	-78.61**	91.83	63.50	-44.62**
L20	54.58	29.68	-83.89**	58.17	35.67	-63.08**
Average	58.14	34.92	-64.73**	65.31	44.17	-46.64**
LSD$_{0.05}$		G=1.97, G×I=2.79,I=0.62			G=2.30, G×I=3.25,I=0.73	
LSD$_{0.01}$		G=2.81, G×I=3.97,I=0.89			G=3.27, G×I=4.62,I=1.03	

TABLE 6. Cont.

Genotypes	WW	WS	Ch%	WW	WS	Ch%
		Pod yield ha-1(PYPH)			pod yield/plant (g)(PYPP)	
		100 seed weight (100-SW)			no. of seeds/plant (SPP)	
L1	56.09	50.09	-11.97**	73.60	50.45	-45.89**
L2	58.92	50.83	-15.91**	84.67	69.27	-22.23**
L3	77.05	63.95	-20.48**	53.37	41.83	-27.57**
L4	49.62	39.54	-25.50**	63.03	52.62	-19.80**
L5	50.28	41.86	-20.13**	81.28	64.52	-25.99**
L6	63.66	48.98	-29.97**	77.17	59.78	-29.08**
L7	65.75	53.82	-22.16**	78.00	60.78	-28.32**
L8	55.13	43.50	-26.74**	84.95	66.02	-28.68**
L9	68.58	54.45	-25.96**	55.63	45.80	-21.47**
L10	55.94	45.86	-21.97**	96.05	71.95	-33.50**
L11	61.04	48.07	-27.00**	147.77	108.10	-36.69**
L12	69.87	53.98	-29.43**	93.52	70.80	-32.09**
L13	67.03	52.27	-28.24**	113.93	83.28	-36.80**
L14	62.80	48.12	-30.51**	122.22	94.77	-28.97**
L15	61.81	52.63	-17.43**	88.68	71.17	-24.61**
L16	76.25	54.64	-39.54**	82.58	67.20	-22.89**
L17	74.76	53.07	-40.87**	119.12	89.35	-33.31**
L18	77.48	57.09	-35.70**	79.97	62.45	-28.05**
L19	72.29	48.99	-47.56**	121.95	101.20	-20.50**
L20 (check)	66.63	50.83	-31.09**	81.83	58.33	-40.29**
Average	64.55	50.63	-27.41**	89.97	69.48	-29.34**
LSD$_{0.05}$		G=3.34, G×I=4.72,I=1.06			G=1.51, G×I=2.13,I=0.48	
LSD$_{0.01}$		G=4.75, G×I=6.71,I=1.50			G=2.14, G×I=3.03,I=0.68	

The superiority of the line 17 in pod yield/ha over the check under water stress was associated with superiority in pod yield/plant, seed weight/plant, no. of pod/plant no. of seed/plant (40.42, 37.52, 46.76 and 34.72, respectively).

Grouping genotypes

Based on relationships between means under water stress and well watering

Mean of pod yield per hectare across years of studied genotypes under well watering (WW) or water stress (WS) was plotted against same trait of the same genotypes under well watering (WW) or water stress (WS) and illustrated in Fig. 1, where numbers from 1 to 20 refer to peanut lines names from L1 to L20, respectively. This made it possible to distinguish between efficient and inefficient peanut lines on the basis of above-average and below-average studied trait under WW or WS together and responsive and non-responsive peanut lines on the bases of above-average and below-average same trait under WW or WS together (Stansell & Pallas, 1985; Vorasoot et al., 2003; Upadhyaya, 2005; Pimratch et al., 2008b; Songsri et al., 2008a; Songsri et al., 2008b and Wunna et al., 2009). Similarly, means of other studied yield traits (PYPP, SWPP, PPP, 100-SW and SPP) under WS were plotted against means of the same traits for the same peanut lines under WW conditions. According to Fig. 1, studied lines was classified into four groups, i.e. water efficient and responsive, water efficient and nonresponsive, water inefficient and responsive and water inefficient and non-responsive based on pod yield/ha, pod yield/plant, seed weight/plant, number of pod/plant, 100 seed weight and number of seed/plant. Based on this classification, the line No. 11(L11), No.13 (L13), No.17 (L17) and No. 19 (L19) had the highest per se means of pod yield/ha, pod yield/plant, seed weight/plant, number of pod/plant, and number of seed/plant under WW and WS simultaneously, i.e. they could be considered as the most water use efficient and the most responsive peanut lines in this study (Fig. 1). On the contrary, the peanut lines No.1 (L1), No.5 (L5), No.3 (L3), No.4 (L4), No.9 (L9), No.8 (L8), No.6 (L6), No.7 (L7) and No.20 (L20) had the lowest means of pod yield/ha, pod yield/plant, seed weight/plant, number of pod/plant, 100 seed weight and number of seed/plant under both WW and WS and could therefore be considered inefficient and nonresponsive lines (Fig. 1).

Based on drought tolerance and pod yield and other traits under water stress

According to drought tolerance index and mean of each pod yield/ha, pod yield yield/plant, seed weight/plant, number of pod/plant, 100 seed weight and number of seed/plant under water stress, studied genotypes were classified into four groups, i.e. tolerant and high-yielding, tolerant and low-yielding, sensitive and high-yielding and sensitive and low-yielding (Fig. 2).

Based on this classification, the lines L11 and L17 exhibited tolerance and high yield, pod yield/ha, number of pod/plant, pod yield per plant, seed per plant and seed weight per plant under water stress conditions. By contrary, the peanut lines L1 and occupied the sensitive and low-yielding group (Fig. 2).

Conclusions

This investigation concluded that water stress causes a significant reduction in peanut lines pod yield/ha, pod yield/plant, seed weight/plant, number of pod/plant, 100 seed weight and number of seed/plant. The rank of peanut lines for studied traits under WS was changed from that under well watering conditions. Developing drought tolerant (T) lines of peanut gave them superiority over sensitive (S) ones in all studied yield parameters (pod yield/ha, pod yield/plant, seed weight/plant, number of pod/plant, 100 seed weight and number of seed/plant) under water stress conditions. It was possible to identify the best water-efficient and responsive lines (L11, L17, L19, L13 and L14), the best tolerant and high-yielding, seed weight and number of pod/plant genotypes (L17 and L11). They could be offered to future breeding programs for improving water stress tolerance, yielding ability and seed yield component traits of peanut genotypes.

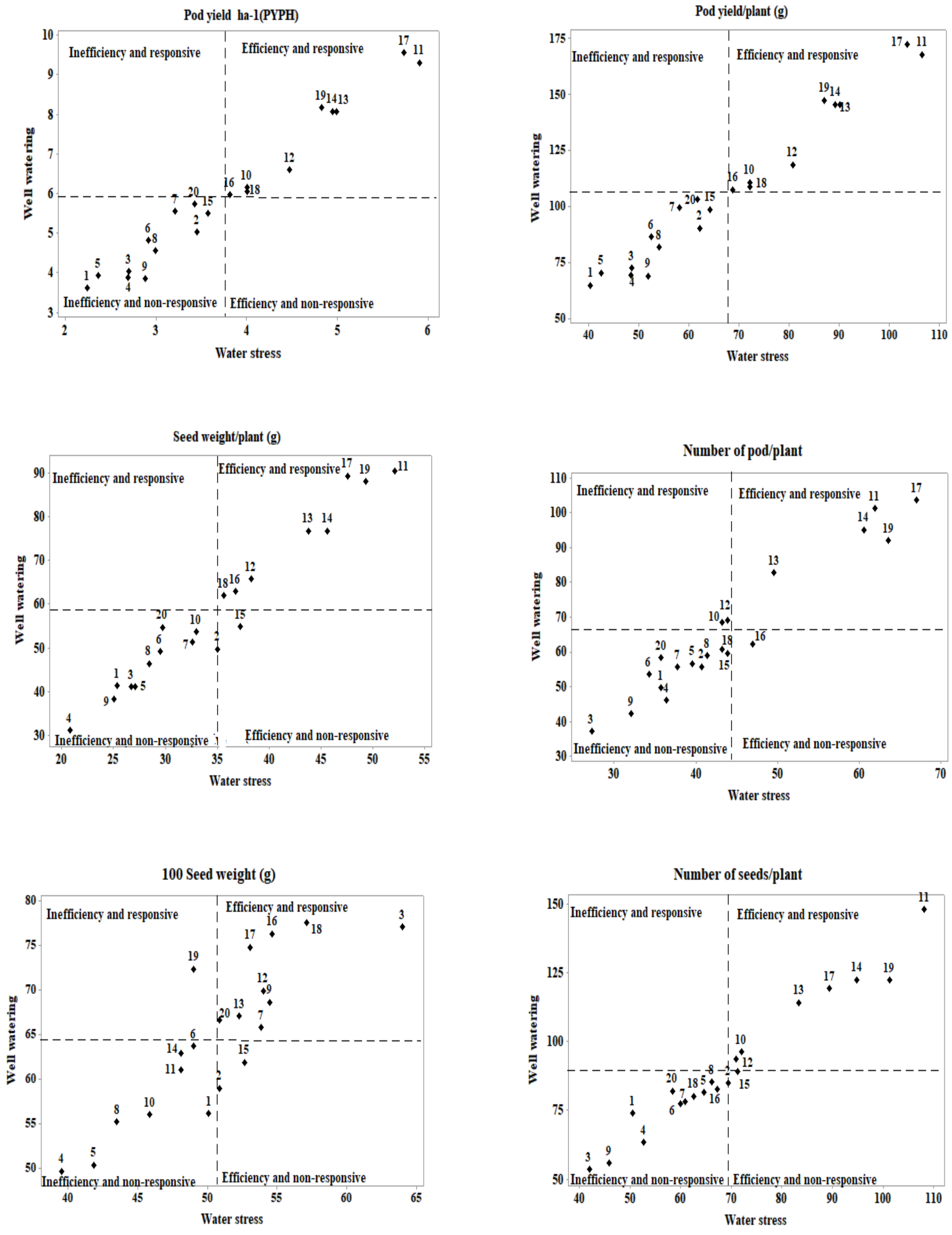

Fig. 1. Relationships between efficiency and responsiveness for pod yield/ha (PYPH), pod yield/plant (PYPP), seed weight/plant (SWPP), number of pod/plant (PPP), 100 seed weight (100-SW) and number of seed/plant (SPP) of 20 peanut lines under water stress and well watering, combined across two seasons. Numbers from 1 to 20 refer to lines names.

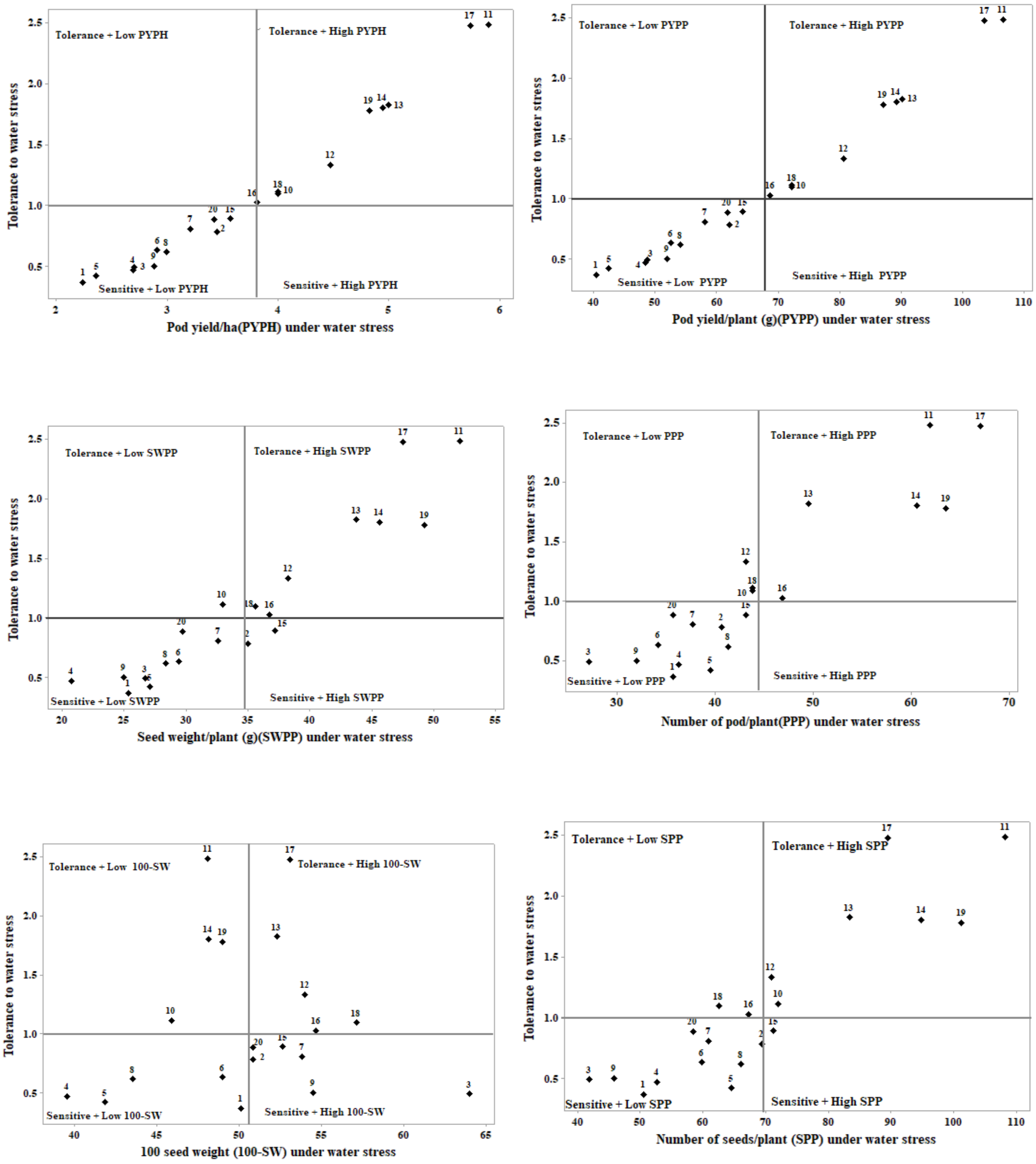

Fig. 2. Relationships between tolerance index (TI) and means of pod yield/ha (PYPH), pod yield/plant (PYPP), seed weight/plant (SWPP), number of pod/plant (PPP), 100 seed weight (100-SW) and number of seed/plant (SPP) of 20 peanut lines under water stress and well watering, combined across two seasons. Numbers from 1 to 20 refer to lines names.

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(*Received* 10/12/2017;
accepted 15/3/2018)

تاثير الجفاف على المحصول ومكوناته لـ 20 تركيب وراثى من الفول السودانى المنزرعة تحت ظروف الأراضى الرملية المستصلحة حديثا

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أجريت هذه الدراسة بمحطة بحوث توشكي - مركز بحوث الصحراء، خلال موسمين زراعيين (2015 و 2016). وقد استخدم لهذه الدراسة عشرون تركيب وراثي من الفول السواني لتقييمهم تحت معاملتين من الري (100% و 67% من السعة الحقلية). وكان التصميم الإحصائي المستخدم لكل تجربة هو قطاعات كاملة العشوائية مع استخدام ثلاث مكررات.

أظهر التحليل الإحصائي فروقا معنوية بين التراكيب الوراثية لكل الصفات التي تم دراستها تحت معاملتي الري وكذلك التحليل المشترك لهم.

أدت معاملة الجفاف إلى نقص ملحوظ في كل الصفات تحت الدراسة مقارنة بظروف الري العادي.

أظهر التحليل الإحصائي فروقا معنوية للتفاعل بين السنوات ومعاملات الري والتفاعل بين السنوات والتراكيب الوراثية والتفاعل بين معاملات الري والتراكيب الوراثية والتفاعل الثلاثي بين السنوات ومعاملات الري والتراكيب الوراثية لجميع الصفات تحت الدراسة، ماعدا التفاعل بين السنوات ومعاملات الري لصفة وزن 100 بذرة والتفاعل الثلاثي بين السنوات ومعاملات الري والتراكيب الوراثية لصفتي عدد البذور للنبات ووزن 100 بذرة كان غير معنوي.

أعطت السلاله رقم 17 أعلى قيم لصفات محصول القرون للنبات والهكتار وعدد القرون للنبات، وأعطت السلاله رقم 11 أعلى قيم لصفتي وزن وعدد البذور للنبات، والسلاله رقم 3 أعطت أعلى قيم لصفة وزن 100 بذرة.