

Productivity of some barley cultivars as affected by supplemental irrigation under rainfed conditions

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Table S1. Principal component analysis for the studied traits of three naked barley cultivars, eigenvalues, proportion, and cumulative variance for the first nine components for supplementally irrigation treatment in 2018/19 and 2019/20 growing seasons (data pooled over the two years).

	PC 1	PC 2	PC 3	PC 4	PC 5	PC 6	PC 7	PC 8	PC 9
PH (cm)	0.30	0.03	0.17	-0.20	0.02	-0.47	0.48	0.50	-0.14
TN. m ⁻²	0.31	0.07	-0.02	-0.15	0.09	0.02	0.12	0.26	0.29
SN.m ⁻²	0.31	0.11	0.01	0.08	-0.05	0.01	-0.11	0.10	0.12
TI (%)	0.26	0.17	-0.38	0.59	0.37	-0.33	-0.32	0.10	-0.16
SL (cm)	0.29	0.08	0.19	0.18	-0.52	0.29	-0.09	0.07	-0.61
SN. Spike ⁻¹	0.29	-0.02	0.13	0.23	0.42	0.29	0.59	-0.47	-0.12
GN. Spike ⁻¹	0.27	-0.03	0.61	0.15	-0.16	-0.41	-0.24	-0.39	0.33
1000 - GW (g)	0.28	0.01	0.27	-0.43	0.51	0.32	-0.47	0.12	-0.13
GY (t ha ⁻¹)	0.29	0.20	-0.08	-0.01	-0.21	0.11	0.01	0.02	-0.02
BY (t ha ⁻¹)	0.31	-0.07	-0.24	0.00	-0.19	0.20	0.01	0.01	0.29
SY (t ha ⁻¹)	0.29	-0.17	-0.28	0.01	-0.17	0.23	0.01	0.01	0.39
HI (%)	-0.16	0.54	0.21	0.13	0.01	0.15	0.05	0.08	0.13
CI (%)	-0.16	0.55	0.15	0.17	0.02	0.22	0.06	0.20	0.27
WUE (Kg m ⁻³)	0.13	0.52	-0.35	-0.49	-0.08	-0.25	0.00	-0.47	-0.13
Eigenvalues	10.11	2.36	0.49	0.38	0.19	0.13	0.11	0.09	0.06
Variance %	72.19	16.85	3.50	2.68	1.36	0.91	0.81	0.64	0.44
Cumulative%	72.19	89.04	92.55	95.23	96.59	97.50	98.31	98.95	99.40

PH: Plant height; TN: Tillers Number m⁻²; SN: Spikes No. m⁻²; TI: Tillering index (%); SL: Spikes length (cm); SN. Spike⁻¹: spikelets No. per spike; GN. Spike⁻¹: grain No. per spike; 100-GW: 1000-grain weight (g); GY: Grain yield (t ha⁻¹); BY: Biological yield (t ha⁻¹); SY: Straw yield (t ha⁻¹); HI (%) Harvest index; CI (%); Crop Index; WUE: Water Use Efficiency (kg ha⁻¹).

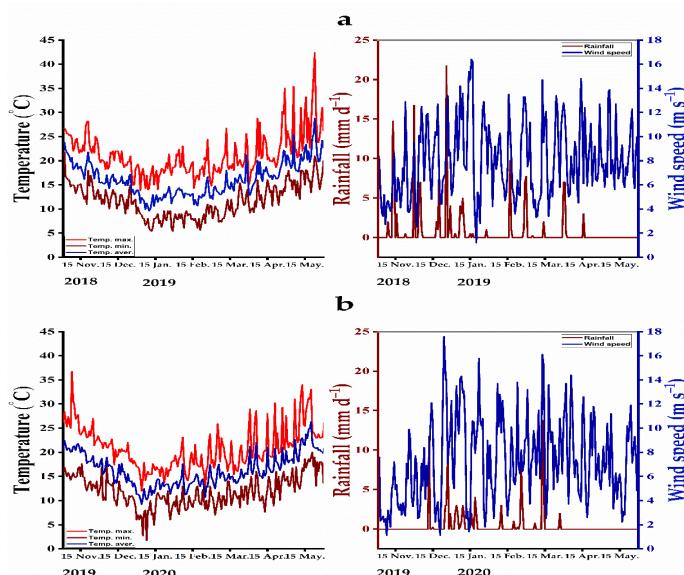


Figure S1. Temperature and wind speed of Al-Kasr area, Marsa Matrouh, North Western Coast of Egypt during seasons of (a) 2018/2019 and (b) 2019/2020.

Table S2. Results of PCs for the studied factors (supplementally irrigation and cultivars) based on the studied traits of naked barley cultivars for the first nine components in 2018/19 and 2019/20 growing seasons (data pooled over the two years).

	PC 1	PC 2	PC 3	PC 4	PC 5	PC 6	PC 7	PC 8	PC 9
SIO C1	-4.24	-0.78	1.89	0.26	-0.30	0.82	-0.43	0.37	0.23
SIO C2	-3.74	-1.39	-0.01	0.40	0.11	-0.11	0.15	0.02	0.03
SIO C3	-2.27	-1.03	-0.23	0.20	1.40	0.06	-0.59	0.14	-0.09
SI1 C1	1.16	1.30	0.73	1.10	0.15	-0.12	-0.05	0.07	0.00
SI1 C2	1.05	-1.84	-1.03	-0.05	-0.50	0.51	-0.08	0.14	-0.16
SI1 C3	3.84	-1.73	-0.93	0.29	0.59	-0.14	-0.27	-0.10	0.41
SI2 C1	3.58	-0.47	0.95	-0.71	0.23	0.55	0.77	0.06	0.01
SI2 C2	3.17	-1.83	-0.48	0.48	-0.21	0.45	-0.31	-0.23	0.01
SI2 C3	4.84	-1.48	-1.04	1.42	-0.28	-0.65	0.86	-0.12	0.52

SIO: rainfall treatment; SI1 and SI2: supplementary irrigation; C1: Giza 129 cultivar; C2: Giza 130 cultivar, C3: Giza 131 cultivar.

Table S3. Principal component analysis for eleven drought tolerance indices of three naked barley cultivars, eigenvalues, proportion, and cumulative variance for the first nine components for moderate and severe drought conditions in 2018/19 and 2019/20 growing seasons (data pooled over the two years).

	PC 1	PC 2	PC 3	PC 4	PC 5	PC 6	PC 7	PC 8	PC 9
TOL	-0.34	0.01	0.13	0.16	0.26	-0.25	0.64	0.14	-0.15
MP	0.32	0.11	0.26	0.39	0.06	-0.17	-0.53	0.24	-0.02
YSI	0.35	0.01	-0.07	-0.03	0.15	-0.34	0.17	0.65	-0.28
SSI	-0.04	0.72	0.44	-0.52	-0.04	-0.08	-0.01	0.02	0.03
GMP	0.33	0.08	0.21	0.25	-0.28	0.19	0.17	0.01	-0.12
STI	0.34	0.08	0.02	-0.06	0.73	0.48	0.06	-0.21	-0.24
HM	0.34	0.06	0.17	0.18	-0.42	0.32	0.46	-0.02	0.08
DI	0.34	-0.07	-0.01	-0.05	0.26	-0.26	0.19	-0.05	0.83
MSTI	0.04	-0.65	0.66	-0.35	-0.01	-0.02	-0.04	0.01	-0.07
SSPI	-0.34	0.00	0.08	0.04	0.09	0.58	-0.07	0.64	0.34
SDI	-0.28	0.12	0.45	0.57	0.21	-0.12	-0.03	-0.22	0.08
Eigenvalues	8.33	1.32	0.83	0.50	0.01	0.01	0.00	0.00	0.00
Variance %	75.71	12.01	7.50	4.54	0.14	0.07	0.01	0.01	0.00
Cumulative%	75.71	87.72	95.23	99.77	99.91	99.98	99.99	100.00	100.00

TOL: tolerance; MP: mean productivity; GMP: Geometric mean productivity; SSI: Stress susceptibility index; STI: Stress tolerance index; YSI: Yield stability index; HM: Harmonic mean; SDI: Sensitivity drought index; DI: Drought resistance index; SSPI: Stress susceptibility percentage index.

Table S4. Results of PCs of the studied three naked barley cultivars under moderate and severe drought conditions for the first nine components in 2018/19 and 2019/20 growing seasons (data pooled over the two years).

	PC 1	PC 2	PC 3	PC 4	PC 5	PC 6	PC 7	PC 8	PC 9
SIO C1	-3.55	-0.26	0.41	0.11	0.16	0.01	-0.04	0.06	-0.01
SIO C2	-2.18	0.32	-0.46	-0.30	-0.01	0.18	0.04	0.03	0.01
SIO C3	-2.00	-0.02	0.85	0.61	0.09	0.09	0.07	0.04	0.00
SI1 C1	3.49	-0.01	0.02	0.16	0.07	0.00	-0.05	-0.01	0.01
SI1 C2	3.08	0.18	0.05	-0.71	0.24	0.04	0.01	-0.03	0.00
SI1 C3	2.37	1.81	1.26	0.09	0.00	0.08	-0.02	-0.01	0.00

SIO: rainfall treatment; SI1 and SI2: supplementary irrigation; C1: Giza 129 cultivar; C2: Giza 130 cultivar, C3: Giza 131 cultivar

Table S5. The physicochemical properties of the experimental soil (0.0 - 40 cm depth) before sowing (data for both years).

Property	Unite	Value	
		2018/19	2019/20
Particle size distribution:			
Coarse sand	(%)	49.15	37.25
Fine sand	(%)	35.67	45.11
Silt	(%)	13.23	15.26
Clay	(%)	1.95	2.38
Texture class	---	Sandy loam	Sandy loam
pH [at a soil: water (w/v) ratio of 1:2.5]	---	8.30	8.21
EC _e (soil - paste extract)	(dS m ⁻¹)	0.224	1.50
Soluble ions:			
Mg ²⁺	(meq L ⁻¹)	1.00	2.77

Ca^{2+}	(meq L ⁻¹)	1.98	3.12
Na^+	(meq L ⁻¹)	0.87	1.15
K^+	(meq L ⁻¹)	0.34	1.11
CaCO_3^+	(%)	17.20	17.16
HCO_3^-	(meq L ⁻¹)	3.82	3.05
Cl^-	(meq L ⁻¹)	0.40	1.82
SO_4^{2-}	(meq L ⁻¹)	2.50	4.10

Physicochemical properties of the experimental soil were analyzed in soil and water lab, Desert research center, Cairo, Egypt.

Table S6. The description of supplemental irrigation (SI) and naked barley cultivars (C) treatments.

A.		Supplemental irrigation (SI)		Total amount of water irrigation (m ³ ha ⁻¹)
Treatment	Description	2018/19	2019/20	
SI0	Without supplementary irrigation (rainfall only), except one supply water irrigation was added at sowing only.	650	650	
SI1	Supply water was added through sprinkler irrigation system on three times, at sowing, at tillering stage, at heading stage of barley	2150	2150	
SI2	Supply water was added through sprinkler irrigation system on four times, at sowing, at tillering stage, at stem elongation stage, at heading stage of barley.	2850	2850	

B. Naked barley cultivars (C)			
Cultivar name	Rain type	Bow type	Pedigree
C1 (Giza 129)	ss	ix	DeirAlla 106/Cel//As46/Aths*2"
C2 (Giza 130)	ss	ix	Comp.cross"229//Bco.Mr./DZ02391/3/DeirAlla 106
C3 (Giza 131)	ss	ix	CM67B/CENTENO//CAMB/3/ROW906.73/4/GLORIABAR/COME-B/5/FALCON BAR/6/LINO

Table S7. Drought tolerance indices equations for the studied naked barley cultivars.

Indices	Equations	Reference
Tolerance (TOL)	$Y_p - Y_s$	Rosielle and Hamblin, (1981).
Mean productivity (MP)	$(Y_s + Y_p)/2$	Rosielle and Hamblin, (1981).
Yield stability index (YSI)	Y_s/Y_p	Bouslama and Schapaugh, (1984).
Stress susceptibility index (SSI)	$1 - (Y_s/Y_p)/1 - (\bar{Y}_s/\bar{Y}_p)$	Fernandez, (1992).
Geometric mean productivity (GMP)	$\sqrt{(Y_s \times Y_p)}$	Fernandez, (1992).
Stress tolerance index (STI)	$(Y_s \times Y_p)/\bar{Y}_p^2$	Fernandez, (1992).
Harmonic mean (HM)	$[2 \times (Y_s \times Y_p)]/(Y_s + Y_p)$	Fernandez, (1992).
Drought resistance index (DI)	$Y_s \times [(Y_s/Y_p)/(Y_s)]$	Moosavi <i>et al.</i> , (2008).
Modified stress tolerance index (MSTI)	Y_s^2 / \bar{Y}_s^2	Farshadfar and Sutka, (2002).
Stress susceptibility percentage index (SSPI)	$[(Y_p - Y_s)/(2 \times \bar{Y}_p)] \times 100$	Moosavi <i>et al.</i> , (2008).
Sensitivity drought index (SDI)	$Y_p - Y_s / Y_p$	Farshadfar and Javadinia (2011).

Y_s , Y_p , and \bar{Y}_s represent yield in stress and non-stress conditions for each genotype, and yield mean in stress and non-stress conditions for all genotypes, respectively.