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## SELECTION FOR DROUGHT TOLERANCE IN SOME IRANIAN FENUGREEK LANDRACES

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(TOL) (SSI) (STI) (GMP) (MP)

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(*Trigonella* sp.)

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(ds\_ahari@yahoo.com)

(ICARDA)

Irano-Turanien Flora

*Trigonella*

Fabaceae

Biomass

*T. foenum-graecum* *T. radiata* *T. hamosa* *T. corniculata* *T. culicers* *T. coerulea*  
*elliptica* *T.tehranica* *T.elliptica*

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*Trigonella foenum-graecum* L.

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'Tristar'

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Mean productivity (MP)

Stress tolerance (TOL)

Stress susceptibility index (SSI)

Geometric mean (GM)

Stress tolerance index (STI)

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Field capacity (FC)

Winterstiger





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Table 1. Mean comparison of grain yield (t ha<sup>-1</sup>) and estimates of drought stress tolerance indices of Iranian fenugreek landraces under field conditions (SI=0.314).

No.	Landrace	YP <sup>††</sup>	YS	TOL	MP	GMP	SSI	STI
1	Ardestan	1.110a <sup>†</sup>	0.730a	0.38	0.92	0.90	1.05	1.05
2	Esfahan	0.830c	0.670ab	0.16	0.75	0.75	0.61	0.72
3	Ahvaz	0.780c	0.550bc	0.23	0.67	0.63	0.90	0.56
4	Borazjan	0.915bc	0.570ab	0.34	0.74	0.72	1.20	0.67
5	Broojerd	0.840c	0.700ab	0.14	0.77	0.77	0.50	0.77
6	Khash	0.815c	0.515ef	0.31	0.66	0.64	1.21	0.53
7	Khorasan	0.855c	0.710ab	0.15	0.78	0.78	0.54	0.80
8	Khoramabad	0.820c	0.560bc	0.27	0.69	0.68	1.00	0.59
9	Rey	0.920ab	0.520cd	0.40	0.72	0.70	1.38	0.63
10	Zanjan	0.840c	0.515de	0.33	0.68	0.66	1.25	0.56
11	Semnan	0.760c	0.480f	0.28	0.62	0.61	1.17	0.47
12	Shiraz	0.980ab	0.650ab	0.32	0.82	0.80	1.10	0.84
13	Yazd	0.960ab	0.590ab	0.37	0.78	0.75	1.24	0.73
14	Ghaenat	0.860c	0.530cd	0.32	0.70	0.68	1.21	0.59
15	Kashan	0.880c	0.670ab	0.21	0.77	0.77	0.71	0.76
16	Kerman	0.885c	0.685ab	0.20	0.79	0.78	0.73	0.78
17	Kermanshah	0.780c	0.580ab	0.20	0.68	0.67	0.78	0.58
18	Neyshaboor	0.780c	0.610ab	0.17	0.69	0.68	0.68	0.61
19	Yasooj1	1.10ab	0.605ab	0.49	0.85	0.81	1.42	0.85
20	Yasooj2	0.890bc	0.625ab	0.27	0.76	0.74	0.96	0.72

† Means followed by similar letters in each column are not significantly different at 5% level, using Duncan's multiple range test.

†† YP = grain yield under irrigated conditions (t ha<sup>-1</sup>), Ys = grain yield under drought conditions (t ha<sup>-1</sup>), TOL = stress tolerance, MP = mean productivity, GMP = geometric mean productivity, SSI = stress susceptibility index and STI = stress tolerance index.

%

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MP ( ) YS ( ) YP ††  
 TOL ( ) SSI GMP  
 STI

Table 2. Mean comparison of dry biomass (t ha<sup>-1</sup>) and estimates of drought stress tolerance indices of Iranian fenugreek landraces under field conditions (SI=0.430).

No.	Landrace	YP <sup>††</sup>	YS	TOL	MP	GMP	SSI	STI
1	Ardestan	2.75ab <sup>†</sup>	1.70ab	1.05	2.22	2.16	0.89	0.64
2	Esfahan	2.57ab	1.70ab	0.87	2.13	2.09	0.80	0.60
3	Ahvaz	2.77ab	1.49ab	1.28	2.13	2.03	1.09	0.57
4	Borazjan	2.70ab	1.46ab	1.24	2.08	1.98	1.08	0.54
5	Broojerd	2.77ab	1.74ab	1.04	2.26	2.20	0.88	0.66
6	Khash	2.70ab	1.35bc	1.34	2.02	1.90	1.17	0.50
7	Khorasan	2.88ab	1.78a	1.11	2.33	2.26	0.90	0.71
8	Khoramabad	2.44bc	1.45ab	0.99	1.95	1.88	0.95	0.49
9	Rey	3.04a	1.41ab	1.63	2.22	2.07	1.26	0.59
10	Zanjan	2.72ab	1.33cd	1.40	2.02	1.90	1.20	0.50
11	Semnan	2.40c	1.19d	1.21	1.79	1.69	1.18	0.39
12	Shiraz	2.93ab	1.62ab	1.32	2.27	2.18	1.05	0.65
13	Yazd	2.86ab	1.50ab	1.37	2.18	2.07	1.12	0.59
14	Ghaenat	2.57ab	1.49ab	1.07	2.03	1.96	0.98	0.53
15	Kashan	2.61ab	1.68ab	0.93	2.14	2.09	0.84	0.60
16	Kerman	2.61ab	1.70ab	0.91	2.16	2.11	0.82	0.61
17	Kermanshah	2.63ab	1.65ab	0.97	2.14	2.08	0.87	0.60
18	Neyshaboor	2.50ab	1.59ab	0.90	2.04	1.99	0.85	0.55
19	Yasooj1	2.98ab	1.51ab	1.46	2.24	2.12	1.16	0.62
20	Yasooj2	2.45bc	1.61ab	0.85	2.03	1.98	0.81	0.54

† Means followed by similar letters in each column are not significantly different at 5% level, using Duncan's multiple range test.

††YP = dry biomass under irrigated conditions ( $t\ ha^{-1}$ ), YS = dry biomass under drought conditions ( $t\ ha^{-1}$ ), TOL = stress tolerance, MP = mean productivity, GMP = geometric mean productivity, SSI = stress susceptibility index and STI = stress tolerance index.

$$\begin{aligned}
 & \frac{MP}{TOL} = \frac{YS}{YP} \times \frac{GMP}{STI} \\
 & \text{where } TOL = \frac{YS}{YP} \times 100\% \\
 & \text{and } SSI = \frac{YS}{YP} \\
 & \text{and } STI = \frac{GMP}{MP} \\
 & \text{and } GMP = \sqrt{MP \times YS}
 \end{aligned}$$



MP STI GMP  
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 MP STI GMP (YS)  
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 (YP, YS)  
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Table 3. Correlation coefficients between drought tolerance indices, grain yield and dry biomass under field conditions.

	YS <sup>†††</sup>	YP	TOL	MP	GMP	SSI	STI
YS	1 <sup>‡</sup>						
YP	0.41 <sup>ns</sup>	1					
TOL	0.13 <sup>ns</sup>	0.68 <sup>††</sup>	1				
MP	-0.39 <sup>ns</sup>	0.73 <sup>††</sup>	0.26 <sup>ns</sup>	1			
GMP	-0.58 <sup>††</sup>	0.80 <sup>††</sup>	0.17 <sup>ns</sup>	0.99 <sup>††</sup>	1		
SSI	0.79 <sup>††</sup>	0.82 <sup>††</sup>	-0.08 <sup>ns</sup>	0.97 <sup>††</sup>	-0.19 <sup>ns</sup>	1	
STI	0.71 <sup>††</sup>	0.63 <sup>††</sup>	0.94 <sup>††</sup>	-0.07 <sup>ns</sup>	-0.40 <sup>ns</sup>	0.97 <sup>††</sup>	1
	0.86 <sup>††</sup>	0.83 <sup>††</sup>	0.16 <sup>ns</sup>	0.99 <sup>††</sup>	1 <sup>††</sup>	-0.17 <sup>ns</sup>	1
	0.86 <sup>††</sup>	0.63 <sup>††</sup>	-0.08 <sup>ns</sup>	0.97 <sup>††</sup>	1 <sup>††</sup>	-0.40 <sup>ns</sup>	1

† and †† Significant at the 5 and 1% levels of probability, respectively. ns = not significant.

‡ In each row, data on above and below are related to grain yield and dry biomass, respectively.

††† YS = grain yield and dry biomass under drought conditions, YP = grain yield and dry biomass under irrigated conditions, TOL = stress tolerance, MP = mean productivity, GMP = geometric mean productivity, SSI = stress susceptibility index and STI = stress tolerance index.

= ns % % †† †  
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Biplot



(RF) ( ) (IR)

(L) (S)

(L×S) × (P≤0.01)

(P≤0.05)

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(CV%)

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Table 4. Mean comparison of dry biomass (DB) (g pot<sup>-1</sup>) and grain yield (GY) (g pot<sup>-1</sup>) of fenugreek landraces under greenhouse condition.

No.	Landrace	GY (g pot <sup>-1</sup> )	(g pot <sup>-1</sup> ) DB
1	Ardestan	0.86ab <sup>†</sup>	2.90de
2	Esfahan	0.49b	2.70de
3	Ahvaz	0.88ab	4.20abc
4	Borazjan	0.67ab	2.40e
5	Broojerd	0.71ab	2.90de
6	Khash	0.43b	4.10abc

Stress index (SI)

7	Khorasan	1.05ab	3.90abc
8	Khoramabad	0.63ab	5.05ab
9	Rey	0.85ab	3.90abc
10	Zanjan	1.32a	5.10a
11	Semnan	0.79ab	4.90abc
12	Shiraz	1.00ab	3.10cde
13	Yazd	0.91ab	3.00de
14	Ghaenat	1.13ab	4.30abc
15	Kashan	0.84ab	2.70de
16	Kerman	0.68ab	3.20cde
17	Kermanshah	0.89ab	3.10cde
18	Neyshaboor	0.86ab	3.30bcd
19	Yasooj1	0.72ab	2.70de
20	Yasooj2	0.83ab	2.90de

† Means followed by similar letters in each column are not significantly different at 5% level, using Duncan's Multiple Range Test.

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 (P≤0.01) .( )

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Table 5. Mean comparison of drought stress level on dry biomass (DB) and grain yield (GY) (g pot<sup>-1</sup>) of fenugreek landraces and GY, DB coefficient of variability (CV %) under green house condition.

Drought stress levels	Traits means		CV%	
	DB(g pot <sup>-1</sup> )	GY (g pot <sup>-1</sup> )	DB	GY
FC	6.34a <sup>†</sup>	1.5a	0	0
2/3 FC	3.41b	0.88b	46	41
1/3 FC	0.81c	0.13c	87.2	91

<sup>†</sup> Means followed by similar letters in each column are not significantly different at 5% level, using Duncan's multiple range test.

%

<sup>†</sup>

( ) ( )  
 TOL SSI  
 ( ) MP STI GMP  
 ( ) MP STI GMP  
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 TOL SSI ( ) ( )  
 ( ) MP STI GMP  
 ( ) ( ) MP STI GMP  
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 (YS) (YP)

r=0.95 ) MP (YP)  
(YS) ( r=0.98  
(r=0.88 r=0.85 ) STI ( r=0.90 r=0.86 ) GMP  
(r=0.99 r=0.98 ) MP (YP)  
(YS)  
(r=0.95) SSI  
(r=0.65) GMP  
MP  
STI GMP  
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Table 6. Estimates of drought stress tolerance indices (dry biomass) of Iranian fenugreek landraces under greenhouse conditions (Stress intensity at 2/3 and 1/3 field capacity are 0.46 and 0.87, respectively).

No.	Landrace	Dry biomass tolerance indices at 2/3 field capacity							Dry biomass tolerance indices at 1/3 field capacity					
		Yp	Ys	TOL	MP	GMP	SSI	STI	Ys	TOL	MP	GMP	SSI	STI
1	Ardestan	4.74	3.15	1.59	3.94	3.86	0.73	0.37	0.83	3.91	2.78	1.98	0.95	0.10
2	Esfahan	4.23	2.88	1.35	3.56	3.49	0.69	0.30	0.89	3.43	2.56	1.94	0.91	0.09
3	Ahvaz	6.76	4.87	1.89	5.81	5.38	0.60	0.82	1.11	5.65	3.93	2.73	0.96	0.19
4	Borazjan	3.37	2.56	0.80	2.96	2.94	0.52	0.22	1.19	2.18	2.28	2.00	0.74	0.10
5	Broojerd	5.42	2.65	2.77	4.04	3.80	1.11	0.36	0.70	4.73	3.06	1.95	1.00	0.09
6	Khash	7.38	4.04	3.34	5.71	5.46	0.98	0.74	0.84	6.53	4.11	2.49	1.02	0.15
7	Khorasan	6.86	4.05	2.81	5.46	5.27	0.89	0.69	0.84	6.03	3.84	2.39	1.01	0.14
8	Khoramabad	10.35	3.69	6.67	7.02	6.18	1.39	0.95	1.12	9.23	5.73	3.40	1.02	0.23
9	Rey	6.72	4.30	2.42	5.51	5.37	0.78	0.72	0.72	6.00	3.72	2.20	1.02	0.12
10	Zanjan	9.92	4.79	5.13	7.36	6.89	1.12	1.19	0.66	9.26	5.29	2.56	1.07	0.16
11	Semnan	9.24	4.68	4.56	6.96	6.57	1.07	1.08	0.71	8.53	4.97	2.55	1.06	0.16
12	Shiraz	5.56	2.85	2.71	4.21	3.98	1.05	0.40	0.97	4.59	3.27	2.32	0.95	0.14
13	Yazd	5.16	3.07	2.09	4.11	3.98	0.88	0.39	0.65	4.51	2.90	1.83	1.00	0.08
14	Ghaenat	8.58	3.36	5.22	5.97	5.37	1.32	0.72	0.93	7.66	4.75	2.82	1.02	0.20
15	Kashan	4.27	3.03	1.24	3.65	3.60	0.63	0.32	0.88	3.40	2.58	1.94	0.91	0.09
16	Kerman	5.63	2.88	2.74	4.26	4.03	1.06	0.40	1.16	4.47	3.39	2.56	0.91	0.16
17	Kermanshah	6.13	2.68	3.44	4.40	4.05	1.22	0.41	0.41	5.72	3.27	1.58	1.07	0.06
18	Neyshaboor	5.76	3.36	2.40	4.56	4.40	0.90	0.48	0.64	5.13	3.20	1.92	1.02	0.09
19	Yasooj1	5.20	2.52	2.69	3.86	3.61	1.12	0.33	0.51	4.69	2.86	1.63	1.03	0.07
20	Yasooj2	5.45	2.88	2.57	4.17	3.97	1.02	0.39	0.44	5.01	2.95	1.56	1.05	0.06

Ys= Dry biomass under drought conditions, Yp= Dry biomass under non stress conditions, TOL= Stress tolerance, MP= Mean productivity, GMP= Geometric mean productivity, SSI= Stress susceptibility index and STI= Stress tolerance index.



$$\left( \frac{Y_p - Y_s}{Y_p} \right) \left( \frac{Y_p - Y_s}{Y_p} \right) \left( \frac{Y_p - Y_s}{Y_p} \right)$$

Table 7. Estimates of drought stress tolerance indices (grain yield) of Iranian fenugreek landraces under greenhouse condition (Stress intensity at 2/3 and 1/3 field capacity are 0.41 and 0.91, respectively).

No.	Landrace	Grain yield tolerance indices at 2/3 field capacity							Grain yield tolerance indices at 1/3 field capacity					
		Yp	Ys	TOL	MP	GMP	SSI	STI	Ys	TOL	MP	GMP	SSI	STI
1	Ardestan	1.55	0.86	0.69	1.20	1.15	1.10	0.61	0.18	1.37	0.86	0.53	0.97	0.13
2	Esfahan	0.68	0.62	0.06	0.65	0.65	0.21	0.19	0.17	0.52	0.42	0.34	0.83	0.05
3	Ahvaz	1.50	1.01	0.50	1.25	1.23	0.81	0.69	0.13	1.38	0.81	0.43	1.00	0.09
4	Borazjan	0.92	0.81	0.11	0.87	0.87	0.30	0.34	0.26	0.66	0.59	0.49	0.78	0.11
5	Broojerd	1.31	0.74	0.58	1.03	0.98	1.08	0.44	0.09	1.23	0.70	0.33	1.02	0.05
6	Khash	0.70	0.54	0.16	0.62	0.62	0.57	0.17	0.04	0.66	0.37	0.17	1.03	0.01
7	Khorasan	1.64	1.32	0.32	1.48	1.47	0.48	1.00	0.17	1.47	0.91	0.53	0.98	0.13
8	Khoramabad	1.11	0.64	0.47	0.88	0.84	1.03	0.33	0.14	0.97	0.62	0.39	0.96	0.07
9	Rey	1.49	1.02	0.47	1.26	1.24	0.77	0.70	0.05	1.44	0.77	0.27	1.06	0.03
10	Zanjan	2.53	1.36	1.17	1.95	1.86	1.14	1.58	0.07	2.46	1.30	0.43	1.06	0.09
11	Semnan	1.34	0.98	0.37	1.16	1.14	0.67	0.60	0.04	1.30	0.70	0.24	1.06	0.03
12	Shiraz	1.85	0.80	1.05	1.33	1.22	1.40	0.68	0.34	1.52	1.10	0.79	0.90	0.28
13	Yazd	1.59	1.04	0.56	1.32	1.29	0.86	0.76	0.10	1.50	0.85	0.41	1.02	0.08
14	Ghaenat	2.38	0.80	1.57	1.59	1.38	1.63	0.87	0.22	2.15	1.30	0.73	1.00	0.24
15	Kashan	1.23	1.06	0.18	1.14	1.14	0.36	0.60	0.23	1.01	0.73	0.53	0.90	0.13
16	Kerman	1.30	0.58	0.72	0.94	0.86	1.37	0.34	0.17	1.13	0.73	0.47	0.95	0.10
17	Kermanshah	1.81	0.80	1.02	1.30	1.20	1.38	0.66	0.06	1.76	0.93	0.32	1.06	0.05
18	Neyshaboore	1.49	1.02	0.47	1.25	1.23	0.78	0.70	0.08	1.41	0.78	0.34	1.04	0.05
19	Yasooj1	1.54	0.73	0.80	1.14	1.06	1.29	0.52	0.02	1.52	0.78	0.15	1.08	0.01

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20	Yasooj2	1.61	0.85	0.76	1.23	1.17	1.17	0.63	0.02	1.60	0.82	0.18	1.08	0.01
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Y<sub>s</sub>= Dry biomass under drought conditions, Y<sub>p</sub>= Dry biomass under non stress conditions, TOL= Stress tolerance, MP=Mean productivity, GMP= Geometric mean productivity, SSI= Stress susceptibility index and STI= Stress tolerance index.

Table 8. Correlation coefficients between drought tolerance indices, grain yield and dry biomass under greenhouse conditions.

	Yp	Ys <sub>1</sub>	Ys <sub>2</sub>	TOL <sub>1</sub>	TOL <sub>2</sub>	MP <sub>1</sub>	MP <sub>2</sub>	GMP <sub>1</sub>	GMP <sub>2</sub>	SSI <sub>1</sub>	SSI <sub>2</sub>	STI <sub>1</sub>	STI <sub>2</sub>
Yp	1 <sup>†††</sup>	0.55 <sup>††</sup>	0.02 ns	0.88 <sup>††</sup>	0.98 <sup>††</sup>	0.95 <sup>††</sup>	0.98 <sup>††</sup>	0.90 <sup>††</sup>	0.40 ns	0.67 <sup>††</sup>	0.45 <sup>††</sup>	0.88 <sup>††</sup>	0.43 ns
Ys <sub>1</sub>	0.71 <sup>††</sup>	1	-0.04 ns	0.08 ns	0.55 <sup>††</sup>	0.78 <sup>††</sup>	0.53 <sup>†</sup>	0.86 <sup>††</sup>	0.18 ns	-0.18 ns	0.24 ns	0.85 <sup>††</sup>	0.10 ns
Ys <sub>2</sub>	0.01ns	0.11 ns	1	0.04 ns	-0.17 ns	0.004 ns	0.20 ns	-0.036 ns	0.90 <sup>††</sup>	-0.06 ns	-0.82 <sup>††</sup>	-0.05 ns	0.88 <sup>††</sup>
TOL <sub>1</sub>	0.93 <sup>††</sup>	0.39 ns	-0.04 ns	1	0.86 <sup>††</sup>	0.69 <sup>††</sup>	0.87 <sup>††</sup>	0.58 <sup>††</sup>	0.38 ns	0.91 <sup>††</sup>	0.67 <sup>††</sup>	0.55 <sup>††</sup>	0.45 <sup>†</sup>
TOL <sub>2</sub>	0.99 <sup>††</sup>	0.69 <sup>††</sup>	-0.11 ns	0.93 <sup>††</sup>	1	0.94 <sup>††</sup>	0.93 <sup>††</sup>	0.89 <sup>††</sup>	0.23 ns	0.67 <sup>††</sup>	0.26 ns	0.87 <sup>††</sup>	0.26 ns
MP <sub>1</sub>	0.98 <sup>††</sup>	0.84 <sup>††</sup>	0.04 ns	0.83 <sup>††</sup>	0.97 <sup>††</sup>	1	0.93 <sup>††</sup>	0.99 <sup>††</sup>	0.36 ns	0.44 <sup>†</sup>	0.43 ns	0.97 <sup>††</sup>	0.37 ns
MP <sub>2</sub>	0.99 <sup>††</sup>	0.71 <sup>††</sup>	0.13 ns	0.92 <sup>††</sup>	0.97 <sup>††</sup>	0.97 <sup>††</sup>	1	0.87 <sup>††</sup>	0.56 <sup>††</sup>	0.65 <sup>††</sup>	0.28 ns	0.85 <sup>††</sup>	0.58 <sup>††</sup>
GMP <sub>1</sub>	0.94 <sup>††</sup>	0.90 <sup>††</sup>	0.04 ns	0.75 <sup>††</sup>	0.93 <sup>††</sup>	0.99 <sup>††</sup>	0.94 <sup>††</sup>	1	0.32 ns	0.32 ns	0.42 ns	0.98 <sup>††</sup>	0.29 ns
GMP <sub>2</sub>	0.76 <sup>††</sup>	0.60 <sup>††</sup>	0.65 <sup>††</sup>	0.67 <sup>††</sup>	0.67 <sup>††</sup>	0.76 <sup>††</sup>	0.83 <sup>††</sup>	0.73 <sup>††</sup>	1	0.22 ns	-0.53 <sup>†</sup>	0.29 ns	0.97 <sup>††</sup>
SSI <sub>1</sub>	0.65 <sup>††</sup>	-0.03 ns	-0.27 ns	0.86 <sup>††</sup>	0.68 <sup>††</sup>	0.49 <sup>†</sup>	0.61 <sup>††</sup>	0.39 ns	0.33 ns	1	0.46 <sup>†</sup>	0.28 ns	0.30 ns
SSI <sub>2</sub>	0.64 <sup>††</sup>	0.38 ns	-0.70 <sup>††</sup>	0.63 <sup>††</sup>	0.72 <sup>††</sup>	0.60 <sup>††</sup>	0.55 <sup>††</sup>	0.58 <sup>††</sup>	0.07 ns	0.67 <sup>††</sup>	1	0.39 ns	-0.47 <sup>†</sup>
STI <sub>1</sub>	0.94 <sup>††</sup>	0.90 <sup>††</sup>	0.05 ns	0.75 <sup>††</sup>	0.93 <sup>††</sup>	0.99 <sup>††</sup>	0.94 <sup>††</sup>	0.99 <sup>††</sup>	0.73 <sup>††</sup>	0.37 ns	0.54 <sup>†</sup>	1	0.26 ns
STI <sub>2</sub>	0.77 <sup>††</sup>	0.56 <sup>††</sup>	0.62 <sup>††</sup>	0.71 <sup>††</sup>	0.69 <sup>††</sup>	0.76 <sup>††</sup>	0.84 <sup>††</sup>	0.72 <sup>††</sup>	0.99 <sup>††</sup>	0.38 ns	0.10 ns	0.72 <sup>†</sup>	1

†† and † Significant at the 1% and 5% levels of probability, respectively. ns= not significant.

= ns % %

† ††

††† data on above and below the diameter are related to grain yield and dry biomass, respectively.

†††

Ys= Grain yield and dry biomass under drought conditions, Yp= Grain yield and dry biomass under irrigated conditions, TOL= Stress tolerance, MP= Mean productivity, GMP= Geometric mean productivity, SSI= Stress susceptibility index and STI= Stress tolerance index.



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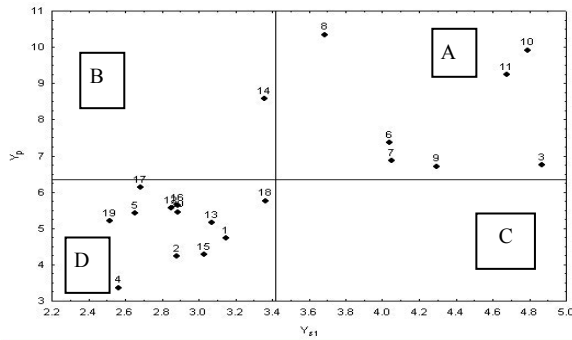


Fig. 3. Biplot based on dry biomass (g) of Iranian fenugreek landraces under greenhouse condition.

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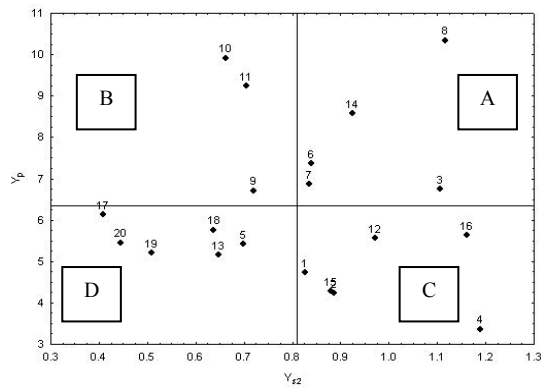


Fig. 4. Biplot based on dry biomass ( $g\ pot^{-1}$ ) of Iranian fenugreek landraces under greenhouse condition.

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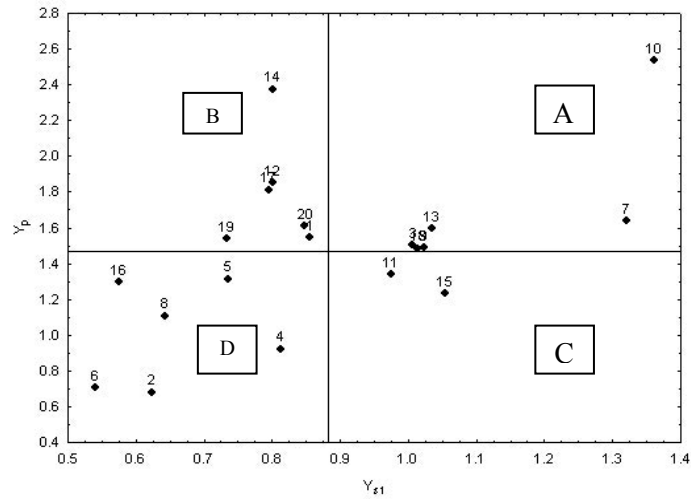


Fig. 5. Biplot based on grain yield (g) of Iranian fenugreek landraces under greenhouse condition.

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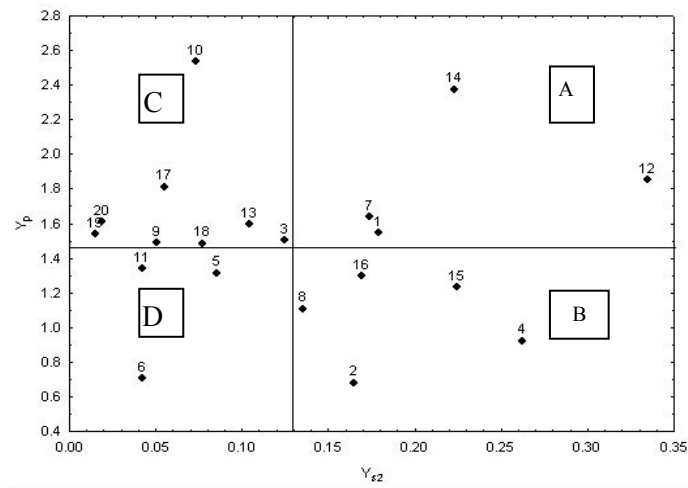


Fig. 6. Biplot based on grain yield (g) of Iranian fenugreek landraces under greenhouse condition.

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