ISSN 1110-0419

Annals Of Agric. Sc., Moshtohor,
Vol. 43(1): 75-88, (2005).

YIELD PRODUCTIVITY AND STABILITY OF SOME PROMISING FORAGE PEARL MILLET [*Pennisetum americanum* (L.)Leeke] GENOTYPES

BY

Ahmed, I. M.; I.M.H. Awad,; Shadia M. Shahwan,; A.H. Fahmy,
Forage Crops Res. Sec., Field Crops Res. Inst., ARC., Giza, Egypt

ABSTRACT

This investigation was conducted at four different locations representing North Delta (Sakha), Middle Delta (Gemmeiza), Middle Egypt (Sids) and Upper Egypt (Assuit) during 2001 and 2002 growing seasons to study the productivity and stability parameters of some promising forage pearl millet [*Pennisetum americanum* (L.)Leeke] genotypes in Egypt.

Concerning total fresh forage yield, over two seasons, data showed insignificant differences between the superior genotypes SDMV 87002 and Syn.2 at Sakha and Assuit; respectively, compared to the check variety. Whereas, the difference were significant among the superior genotypes ICMV 87101 and Syn.2 at Gemmeiza and Sids; respectively, when compared with the check variety.

Regarding total dry forage yield, over two seasons, the differences between the high rank genotypes SDMV 87002 and WCC 75 at Sakha and Assuit; respectively, were insignificant compared to the check variety, whereas it were significant among the superior genotypes ICMV 155 and Syn.2 at Gemmeiza and Sids; respectively, and the check variety.

Over the four locations and the two seasons, data indicated that there were no significant differences among the total fresh and dry yield of the two superior genotypes (Syn.2 and SDMV 87002) and the check variety.

Mean squares of genotypes, environments and genotypes x environments interaction were highly significant for total fresh and dry forage yield.

As an average performance of all genotypes, data indicated that total fresh and dry forage yield were higher at Sids than the other locations.

Regarding to total fresh forage yield, regression coefficient (b_i) was not significant for all genotypes except SDMV 90011,while S^2d_i value was significant for all genotypes except U.S.A 6.

Concerning total dry forage yield, regression coefficient (b_i) was not significant for all genotypes except SDMV 90011, ICMV 155 and Shandweel 1.

Also, the values of S^2d_i was not significant for all genotypes except A.F.POP 88, Syn.1, ICMV 155 and Shandweel 1.

Based up on all of the studied parameters, it was quite clear that regarding total fresh forage yield, the only promising genotype was U.S.A. 6 whereas for total dry forage yield the four promising genotypes were SDMV 87002, ICMV 87101, U.S.A.6, and Syn. 2 which had high yield, good response to changes in environmental conditions and better stability. Therefore, it seams that the promising genotype U.S.A.6 could be grown for higher forage yield with better stability under different environmental conditions. Therefore, this variety is the most promising which may be recommended for breeding programs of forage pearl millet.

Key words: Pearl Millet [*Pennisetum americanum*)- Performance -Genotypes X environments interactions - Stability parameters --Regression coefficient (b_i)- Deviation from regression (S^2d_i) - Forage yield.

INTRODUCTION

Nowadays, pearl millet [*Pennisetum americanum* (L.)Leeke] is considered one of the most important summer forage crops. Different factors may be related to the increase of importance of pearl millet as forage. Pearl millet has a high nutritive value in comparison with the other summer forage crops. It is characterized with exceptional ability to tolerate adverse conditions specially drought and high temperature. In addition, pearl millet could be grown in areas which are too arid for growing forage sorghum. Also, prohibiting growing forage sorghum adjacent to maize due to the susceptibility with downy mildew disease is another important aspect. It seams that pearl millet retains high resistance to such disease. Moreover the green fodder yield can be fed to cattle without any harmful effect at any stage of growth (Gupta and Sehgal, 1971). All these factors and others factors are involved in the expansion of pearl millet cultivation in Egypt.

The yielding ability of most of varieties varied according to environmental conditions (El-Shahawy and Marei,1995). Genotype-environment interaction is one of the major concerns for plant breeder in generating and developing improved varieties. Several authors have studied the causes of observed interactions between genotypes and environments (GE). The early attempt focused on the importance of GE interactions in plant breeding based on regression analysis (Yates and Cochran 1938) to measure the adaptation of barley varieties. They proposed that when genotypes were tested in several environments, the yield of each genotype should be regressed on the mean yield of all genotypes in each environment. Finlay and Wilkinson (1963) proposed average yield of all varieties for each site and season, as a measure of that environment 'environmental value'. They considered the regression coefficient (b_i) of mean for each genotype yield performance on the mean yield of all genotypes for each site and season, as a measure of adaptability. Eberhart and Russell (1966) suggested the use of 'environmental index' for each environment, as the deviation of mean performance under the environment from the grand

mean of all environments. They pointed out that both of the regression coefficient (b_i) and the deviation from regression of a variety on the environmental indices (S^2d_i) are considered as parameters for response and stability of a variety, respectively. So, stability in yielding ability is one of the most desirable properties of a variety to be released for an economic large scale cultivation. For this purpose the multi locations trials over a number of years should be conducted (Tehlan, 1973 and Luthra *et al.* 1974).

Therefore, the purpose of the present investigation is to study the productivity and stability of some promising forage pearl millet (*Pennisetum americanum*) genotypes under various locations in Egypt.

MATERIALS AND METHODS

This study was conducted at four experimental stations representing North Delta (Sakha), Middle Delta (Gemmeiza), Middle Egypt (Sids) and Upper Egypt (Assuit) during 2001 and 2002 seasons. Ten genotypes of pearl millet (*Pennisetum americanum* and local variety (Shandweel 1) as a check variety were included in this investigation. The forage pearl millet genotypes and the local variety were as follows:

1-SDMV 87002 (introduced from India)
2-SDMV 90011 (introduced from India)
3-A.F.POP 88 (introduced from India)
4-Syn.1 (consistes of the above three varieties, where these varieties were superior in previous experiment that was conducted earlier.)
5-ICMV 87101 (introduced from India)
6-WCC 75 (introduced from India)
7-ICMV 155 (introduced from India)
8-U.S.A. 6 (introduced from U.S.A.)
9-SUDAN 1 (introduced from Sudan)
10-Syn.2 (consistes of the above five varieties, where these varieties were superior in other experiment that was conducted before
11-Shandwell (local variety as a check) .

During 2001 and 2002 seasons, the 10 genotypes of forage pearl millet and the local variety (Shandwell) were sown in a field trial designed as a randomized complete block (RCBD) with four replicates. Plot size was 6 m^2. Seeds were drilled in rows of 30 cm apart and 3m.long at a rate of 15 kg /fed. Appropriate agricultural practices were followed during the two growing seasons at each location.

Three cuts were taken at each season/ location, the first, second and third cuts were taken after 50,90,125 day from sowing, respectively.

Data of fresh and dry forage yield of the three cuts and total yield were recorded in kg/plot for all cuts, then transformed to ton/fed. Combined analysis of variance over the two seasons at each location for the 11 genotypes for total fresh and dry yield was executed. Also, a combined analysis of variance over seasons

and locations for the ten genotypes under study was carried out for total fresh and dry yield.

The procedures of these analyses of variance were performed as outlined by Steel and Torrie (1960) and McIntosh (1983).

Stability parameters were estimated considering seasons – locations as separate environment following the model of Eberhart and Russell (1966), where the stable variety has a high mean yield, b_i value equal one and the deviation from regression near zero. Also, Eberhart and Russell (1969), reported the most important stability parameter appeared to be of the minimum deviations mean squares.

RESULTS AND DISCUSSION

Fresh and dry forage productivity:

Performance of the tested genotypes for total fresh forage yield at each location and their relatives to check variety over the two seasons are presented in Table (1). Data over the two seasons for total fresh forage showed significant differences among the 11 genotypes at all locations except Assuit. The average performance of the 11 genotypes for total fresh yield at Sids (42.81 ton/fed.) was higher than in the other locations. The total fresh forage yield of the 11 pearl millet genotypes ranged from 36.43 to 47.3 ton/fed. with an average of 40.98 ton/fed at Sakha, ranged from 27.55 to 35.99 ton/fed. with an average of 32.04 ton/fed at Gemmeiza, ranged from 38.37 to 48.69 ton/fed. with an average of 42.81 ton/fed at Sids, and ranged from 33.12 to 36.55 ton/fed. with an average of 34.82 ton/fed at Assuit .

The varieties SDMV 87002. and U.S.A. 6 were superior in producing the highest yield of 47.30 and 43.84 ton /fed., respectively, but without significantly increase in yield of check variety at Sakha . On the other hand, the lowest yield (36.43 ton/ fed.) was obtained from the variety ICMV155. The three varieties of ICMV 87101, SDMV90011 and ICMV 155 were among the top rank, which gave the highest yield and significantly exceeded the check variety by 17.2, 14.8 and 12.9%, respectively, at Gemmeiza. On the other hand, the variety Sudan 1 was the lowest one. The two genotypes of Syn.2 and SDMV 87002 were superior in production, and exceeded the check variety. Syn.2 recorded significantly excess yield than the check variety by 7.4% at Sids, while the variety WCC75 produced the lowest yield (38.37 ton/fed.). There was not significant differences among all of the tested ten genotype of pearl millet under study and the check variety for fresh yield at Assuit.

Over the four locations and the two seasons, data indicated that there were no significant differences among the yield of the two superior genotypes (Syn.2 & SDMV 87002) and the check variety (Shandweel 1).

Results over the two seasons for total dry forage yield of genotypes at each location and their relatives to check variety are presented in Table (2). Data showed significant differences among the eleven tested genotypes at all locations

except at Assuit. The average performance of 11 genotypes for dry yield at Sids (6.107) was also higher than at other locations. The total dry yield of 11pearl millet genotypes under study ranged from 5.269 to 6.865 ton /fed. with an average of 6.03 ton/fed. at Sakha, ranged from 4.721 to 5.872 ton /fed. with an average of 5.261 ton/ fed. at Gemmeiza, ranged from 5.379 to 6.865 ton /fed. with an average of 6.107 ton/ fed. at Sids, and ranged from 5.023 to 5.681 ton /fed. with an average of 5.372 ton/ fed. at Assuit .

Dry forage yield, behaved in a similar manner as that of fresh yield. this was for all locations except Gemmeiza. Where the same two varieties (SDMV 87002. and U.S.A. 6) had the highest yield at Sakha, and were 6.865 and 6.821 ton /fed, respectively, but without significant excess than the yield of the check variety. The same variety ICMV155 was also the lowest one (5.269 ton/fed). The varieties ICMV 155, ICMV 87101, SDMV90011, WCC 75, Syn2 and Syn1 were at the top rank, which produced the highest yield and significantly exceeded the check variety by 24.3, 24.1, 21.5, 17.7, 15.4 and 12..1 %, respectively, at Gemmeiza. On the other hand, the variety Sudan 1 had the lowest forage yield. The same trend obtained at Sids whereas the highest yield was obtained from the same two genotypes (Syn2 and SDMV 87002). It outyielded the check variety, and only Syn2 recorded significant excess than the check variety by 5.4%. While the variety WCC75 produced the lowest yield (5.682 ton/fed.). At Assuit, the differences among the11 genotypes of pearl millet under study had no significant differences for dry yield.

Over the four locations and the two seasons, dry yield data showed similar results to that of total fresh yield, whereas the yield differences among genotypes Syn2, U,S.A.6, SDMV87002 and ICMV 87101 were not significant .

These results were in agreement with those obtained by El-Shahawy and Gheit (1999), who found that genotypes SDMV 87002, SDMV 90011 and Af-POP 88 outyielded the check by 10% of the total fresh and dry forage yields over the two growing seasons.

Generally, over the four locations and the two seasons, data indicated that there were no significant differences among the total fresh and dry yield of two superior genotypes (Syn.2 and SDMV 87002) and the check variety.

Stability analysis

Combined analysis of variance for the total fresh and dry forage yield over all environments are listed in Table (3). Mean squares of varieties, environments and varieties by environments interaction were highly significant for both total fresh and dry forage yield. Highly significant variance of varieties revealed the presence of genetic variability among the tested varieties for total fresh and dry forage yield. The obtained highly significant mean squares of environments indicated that the performance of these traits differed largely by environmental conditions. The significance of varieties x environments interactions proved that the performance of the different varieties varied from an environment to another. Significance effect of varieties, environments and varieties by environments interactions are in agreement with that obtained by El-Shahawy and Marei (1995).

Table (1): Total fresh forage yield of the tested pearl millet genotypes at each location and their relatives to check variety over the two seasons.

No.	Genotypes	Sakha		Gemmeiza		Sids		Assuit		Means	
		(ton/fed.)	Relative to check variety (%)	(ton/fed.)	Relative to check Variety (%)	(ton/fed.)	Relative to check variety (%)	ton/fed.)	Relative to check variety (%)	(ton/fed.)	Relative to check variety (%)
1	SDMV 87002	47.30	110.6	30.63	99.8	46.84	103.3	33.12	92.5	39.47	102.1
2	SDMV 90011	39.81	93.1	35.24	114.8	38.85	85.7	33.60	93.9	36.87	95.4
3	A.F.POP 88	38.97	91.1	29.97	97.6	44.10	97.2	33.79	94.4	36.70	94.9
4	Syn. 1	41.53	97.1	32.91	107.2	41.83	92.2	35.07	98.0	37.84	97.9
5	ICMV 87101	40.05	93.6	35.99	117.2	43.23	95.3	35.04	97.9	38.57	99.8
6	WCC 75	41.21	96.3	31.26	101.8	38.37	84.6	35.74	99.8	36.64	94.8
7	ICMV 155	36.43	85.1	34.67	112.9	41.30	91.1	35.18	98.3	36.89	95.4
8	U.S.A. 6	43.84	102.5	30.89	100.6	43.05	94.9	34.92	97.5	38.17	98.7
9	SUDAN 1	37.16	86.9	27.55	89.7	39.42	86.9	34.20	95.5	34.58	89.4
10	Syn. 2	41.77	97.6	32.64	106.3	48.69	107.4	36.55	102.1	39.91	103.2
	Means	40.81	95.4	32.18	104.8	42.57	93.9	34.72	97.0	37.56	97.2
11	Shandweel 1	42.76	100	30.69	100	45.33	100	35.78	100	38.64	100
Over all means		40.98		32.04		42.81		34.82		37.66	
L.S.D. at 0.05		5.03		2.35		2.13		N.S.		1.73	

N.S. = not significant.

Table (2): Total dry forage yield of the tested pearl millet genotypes at each location and their relatives to check variety over the two seasons.

No.	Genotypes	Sakha		Gemmeiza		Sids		Assuit		Means	
		(ton/fed.)	Relative to check Variety (%)	(ton/fed.)	Relative to check variety (%)	(ton/fed.)	Relative to check variety (%)	(ton/fed.)	Relative to check variety (%)	(ton/fed.)	Relative to check variety (%)
1	SDMV 87002	6.865	104.9	4.838	102.4	6.664	102.3	5.023	90.9	5.847	100.3
2	SDMV 90011	5.878	89.8	5.742	121.5	5.379	82.5	5.112	92.6	5.528	94.8
3	A.F.POP 88	5.583	85.3	4.745	100.4	6.249	95.9	5.095	92.2	5.418	93.0
4	Syn. 1	5.737	87.7	5.299	112.1	5.972	91.6	5.430	98.3	5.609	96.2
5	ICMV 87101	6.153	94.0	5.866	124.1	5.998	92.0	5.340	96.7	5.839	100.2
6	WCC 75	5.764	88.0	5.561	117.7	5.682	87.2	5.681	102.8	5.672	97.3
7	ICMV 155	5.269	80.5	5.872	124.3	5.781	88.7	5.496	99.5	5.605	96.2
8	U.S.A. 6	6.821	104.2	5.068	107.2	6.344	97.4	5.496	99.5	5.932	101.8
9	SUDAN 1	5.565	85.0	4.721	99.9	5.731	87.9	5.326	96.4	5.336	91.5
10	Syn. 2	6.157	94.1	5.452	115.4	6.865	105.4	5.566	100.7	6.005	103.1
	Means	5.979	91.3	5.316	112.5	6.066	93.1	5.356	97.0	5.679	97.5
11	Shandweel 1	6.543	100	4.724	100	6.513	100	5.522	100	5.825	100
Over all means		6.030		5.261		6.107		5.372		5.693	
L.S.D. at 0.05		0.906		0.387		0.315		N.S.		0.301	

N.S. = not significant.

Table (3): Combined analysis of variance for total fresh and dry forage yield over environments.

Source of variance	d.f.	Mean squares	
		Fresh forage yield	Dry forage yield
Genotypes (G.)	10	73.731 **	1.482 **
Environments (E)	7	1397.000 **	24.752 **
Reps (E)	21	39.37	1.300
G. X E.	70	44.641 **	1.368 **
Pooled error	240	12.292	0.373

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

Tables (4) and (5) showed the performance of the studied promising genotypes under the given eight environments for the total fresh and dry forage yield. At sids the highest total fresh forage yield (44.51 ton/fed) was obtained in first season . However, Gemmeiza in second season gave the lowest yield (31.92 ton/fed). Regarding the genotypes effect, Syn.2 gave the highest total fresh forage yield (39.91 ton/fed) over all of the eight environments with significant difference from all genotypes except SDMV 87002, Shandweel 1 and ICMV 87101. As previously shown in the combined analysis of variance from the highly significance mean square of genotypes x environments interaction, the ranking of genotype performance for total fresh yield varied from an environment to another (Table 4). The varieties SDMV 87002 and Syn2 ranked the first under Sids, also, SDMV 87002 ranked the first under Sakha in the first season.

Regarding total dry forage yield, data indicated that Assuit produced the highest production (6.491 ton/fed) in second season. Concerning the genotypes effect, the same trend of total fresh forage yield was obtained for total dry forage yield. Whereas, Syn2 gave the highest total dry forage yield (6.005 ton/fed) over all eight environments with significant difference for all genotypes except U.S.A. 6, SDMV 87002, ICMV 87101, and Shandweel 1. Highly significant mean squares of genotypes x environments interaction for total dry forage yield showed the ranking of genotype performance for total dry yield varied from an environment to another (Table 5). The genotypes SDMV 87002 at Sakha and Shandweel 1 at Assuit ranked the first in the second season .

Data of the analysis of variance for total fresh and dry forage yields when stability parameters are estimated and presented in Table (6). As shown, the linear response of environment was highly significant for both traits. Also Mean squares of the pooled deviation was highly significant for both total fresh and dry forage yield. Similar results were recorded by Sharma *et al* (1984), who found significant mean squares due to pooled deviation for fresh yield

Table (4): Total fresh forage yield (ton/fed.) of the tested pearl millet genotypes under different environments (4 locations x 2 seasons).

No.	Genotypes	First season (2001)				Second season (2002)				Means
		Sakha	Gemmeiza	Sids	Assuit	Sakha	Gemmeiza	Sids	Assuit	
1	SDMV 87002	49.28	32.81	52.41	30.71	45.33	28.44	41.28	35.53	39.47
2	SDMV 90011	38.33	33.63	41.83	32.03	41.30	36.84	35.88	35.18	36.87
3	A.F.POP 88	34.02	27.91	45.41	28.74	43.93	32.03	42.79	38.85	36.70
4	Syn. 1	40.19	31.17	43.31	28.84	42.88	34.65	40.34	41.30	37.84
5	ICMV 87101	39.14	35.05	47.08	30.71	40.95	36.93	39.38	39.38	38.57
6	WCC 75	41.82	31.27	36.49	29.12	40.60	31.24	40.25	42.35	36.64
7	ICMV 155	33.67	37.05	39.20	29.05	39.20	32.29	43.40	41.30	36.89
8	U.S.A. 6	43.57	31.15	47.34	28.19	44.10	30.63	38.76	41.65	38.17
9	SUDAN 1	34.25	24.48	42.09	25.71	40.08	30.63	36.75	42.70	34.58
10	Syn.2	42.06	33.69	49.53	31.80	41.48	31.59	47.86	41.30	39.91
11	Shandwel 1	44.39	35.47	44.98	27.81	41.13	25.9	45.68	43.75	38.64
	Means	40.07	32.15	44.51	29.34	41.90	31.92	41.12	40.30	37.66

L.S.D. at 0.05 G.= 1.727 , L.S.D. at 0.05 E. = 1.967 and L.S.D. at 0.05 G.x E. = 4.884

Table (5): Total dry forage yield (ton/fed.) of the tested pearl millet genotypes under different environments (4 locations x 2 seasons).

No.	Genotypes	First season (2001)				Second season (2002)				Means
		Sakha	Gemmeiza	Sids	Assuit	Sakha	Gemmeiza	Sids	Assuit	
1	SDMV 87002	6.547	4.957	6.946	4.322	7.182	4.719	6.383	5.724	5.847
2	SDMV 90011	5.382	5.217	5.453	4.565	6.374	6.276	5.305	5.658	5.528
3	A.F.POP 88	4.602	3.947	5.969	3.954	6.565	5.544	6.530	6.237	5.418
4	Syn.1	6.303	4.717	6.111	4.223	5.171	5.880	5.834	6.636	5.609
5	ICMV 87101	5.639	5.159	6.426	4.298	6.666	6.574	5.570	6.381	5.839
6	WCC 75	5.674	5.573	5.146	4.458	5.853	5.550	6.217	6.905	5.672
7	ICMV 155	4.660	6.355	5.328	4.439	5.878	5.390	6.234	6.553	5.605
8	U.S.A. 6	6.745	4.591	6.992	4.135	6.898	5.545	5.697	6.858	5.932
9	SUDAN 1	5.301	3.865	6.110	3.836	5.830	5.578	5.353	6.816	5.336
10	Syn.2	6.244	5.371	6.902	4.645	6.070	5.494	6.829	6.488	6.005
11	Shandwel 1	6.687	4.914	6.325	3.903	6.399	4.534	6.701	7.141	5.825
	Means	5.799	4.969	6.155	4.252	6.262	5.552	6.059	6.491	5.693

L.S.D. at 0.05 G.= 0.301, L.S.D. at 0.05 E. = 0.358 and L.S.D. at 0.05 G.x E. = 0.851

Table (6): Analysis of variance for total fresh and dry forage yield of pearl millet genotypes when stability parameters are estimated.

Source of variance	d.f.	Mean squares for forage yield	
		Fresh	Dry
Total (VEnv-1)	87	39.2013	0.8156
Varieties (V-1)	10	18.4354	0.3705
Env.+ V. X Env. (V(Env-1))	77	41.8982**	0.8734**
Environments (Env.) (Linear)	1	2445.01**	43.3116**
V. X Env. (V-1) (Linear)	10	18.8497	0.4154
Pooled deviation (V(Env-2))	66	9.8776**	0.2998**
SDMV 87002	6	23.0926**	0.5278**
SDMV 90011	6	5.4754	0.2337*
A.F.POP 88	6	8.8926**	0.3451**
Syns1	6	1.9994	0.2667**
ICMV 87101	6	4.6890	0.2340*
WCC 75	6	9.7736**	0.2529*
ICMV 155	6	12.2864**	0.5344**
U.S.A 6	6	3.4721	0.2376*
SUDAN 1	6	10.1567**	0.1876
Syns 2	6	6.3161	0.1501
Shandwel1	6	12.6221**	0.3276**
Pooled error (Env(R-1)(V-1))	240	3.0730	0.0932

(* and ** Significant at 0.05 and 0.01 levels of probability, respectively.)

Therefore, the regression coefficient (b_i) on the environmental index and deviation from regression mean squares (S^2d_i) pooled over all environments were calculated for each variety and presented in Table (7).

Table (7): Mean values and stability parameters for total fresh and dry forage yield of eleven pearl millet genotypes

Genotypes	Fresh forage yield			Dry forage yield		
	$\bar{X}$	b_i	S^2d_i	$\bar{X}$	b_i	S^2d_i
SDMV 87002	39.47	1.3762	20.0196*	5.847	1.1275	0.4346
SDMV 90011	36.87	0.4799*	5.4024*	5.528	0.4982*	0.1405
A.F.POP 88	36.70	1.1345	5.8196*	5.418	1.2794	0.2519*
Syn1	37.84	0.9550	-1.0735*	5.609	0.9044	0.1735*
ICMV 87101	38.57	0.7602	1.6160*	5.839	0.9303	0.1408
WCC 75	36.64	0.8051	6.7006*	5.672	0.7316	0.1597
ICMV 155	36.89	0.6427	9.2133*	5.605	0.5287*	0.4412*
U.S.A 6	38.17	1.2472	0.3991	5.932	1.3693	0.1444
SUDAN 1	34.58	1.1476	7.0837*	5.336	1.2731	0.0944
Syn2	39.91	1.1628	3.2430*	6.005	0.9279	0.0569
Shandwel 1	38.64	1.2885	9.5491*	5.979	1.4296*	0.2344*
Means	37.66	1.0000	5.9006	5.693	1.0000	0.2065
Standerd error	± 0206	± 0.2049	± 0.0860	±1.1878	± 0.2108	± 0.4938

*; indicate significant at 0.05 level of probability.

Regarding total fresh forage yield, the six genotypes of SDMV 87002, Syn1, ICMV 87101, U.S.A.6, Syn.2 and Shandweel 1 performed better than the average performance. These varieties could be of some use for the breeders because the genotypes with below average performances are of little practical utility even if they are stable. Regression coefficient (b_i) was not significant for all genotypes except SDMV 90011. Breese (1969) reported that the environmental condition was effective on the response of varieties. All genotypes except SDMV 90011 possessed b_i values equal to one. Therefore, the above genotypes except SDMV 90011 were of an averages responsive to changes in various environments and could perform well under average environmental conditions. All genotypes showed significant trend for non-linearity except U.S.A. 6. So, S^2d_i value was not equal zero for all genotypes except U.S.A. 6. According to Eberhart and Russell (1966 and 1969), U.S.A.6 was more stable than the others for this trait under the all environmental conditions studied.

Concerning total dry forage yield, the five genotypes SDMV 87002, ICMV 87101, U.S.A.6, Syn2 and Shandweel 1 performed better than the average performance. Regarding the response of varieties to the change in various environmental conditions, all these genotypes had a regression coefficient equal to one except SDMV 90011, ICMV 155 and Shandweel 1 for this studied trait. No significant values of S^2d_i revealed better stability for all genotypes except A.F.Pop 88, Syn1, ICMV 155 and Shandweel 1. According to the reports of Eberhart and Russell (1966 and 1969), the four genotypes i.e. SDMV 87002, ICMV 87101, U.S.A.6, and Syn2 were more stable than others for this trait under the eight studied environments.

On the basis of all the investigated parameters, it is quite clear that the only promising genotype is U.S.A. 6 for total fresh forage yield,, and the four promising genotypes SDMV 87002, ICMV 87101, U.S.A.6, and Syn.2 for total dry forage yield which had high yield and good response to the changes in environmental conditions and better stability. Therefore, the promising genotype U.S.A. 6 could be grown for high yield and better stability of forage production under different environmental conditions. Moreover, this variety is most promising and could be recommended as good source in breeding programs of forage pearl millet.

REFERENCES

Breese, E.L. (1969): The measurement and significance of genotype-environment interactions in grasses. Heredity 24: 27-44.

Eberhart, S.A. and W.A. Russell (1966): Stability parameters for comparing varieties. Crop Sci. 6: 36-40.

Eberhart, S.A. and W.A. Russell (1969): Yield and Stability for a 10 line diallel of single cross and double cross maize hybrids. Crop Sci. 9: 357-361.

EL-Shahawy, A. E. and Z.M. Marei (1995): Evaluation of forage yield and quality of pearl millet [*Pennisetum americanum* (L.) Leeke]. J. Agric. Res. Tanta Univ. 21(3): 409-418.

El-Shahawy, A.E. and G. S. Gheit (1999): Evaluation and screening of some pearl millet [*Pennisetum americanum* (L.) Leeke] genotypes. J. Agric. Res. Tanta Univ. 21(3): 409-418.

Finlay, K.W. and G.N. Wilkinson (1963): The analysis of adaptation in a plant breeding program. Aust. J.Agric. Res. 14: 742-754.

Gupta, V.P. and K.L. Sehgal, (1971): Genetic variation for chemical composition of bajra fodder in pearl millet. Indian J. of Genetic & Plant breeding 31(3): 416-420.

Luthra, O.P., R.K. Singh, and S.N. Kakar (1974): Comparison of different stability modeles in Wheat. Theor. Appl. Genet. 45: 143-149.

McIntosh, M.S. (1983): Analysis of combined experiments. Agron. J. 75:153-156.

Sharma, G.D, R.S. Paroda, G.P. Lodhi and P.K. Verma (1984): Studies on phenotypic stability for green and dry fodder in sorghum. Forage Res. 10: 1-4.

Steel, R.G. and I.H. Torrie (1960): Principles and procedures of statistics. Mc Graw-Hill Bock Co., New York.

Tehlan, R.S. (1973): Studies on production pattern and correlations in wheat. M.Sc. Thesis, Haryana, Agric. Univ. Hissar.

Yates, F. and W.G. Cochran (1938): The analysis of groups of experiments. J. Agric. Sci., Camb. 28: 556-580.

الإنتاجية والثبات المحصولي لبعض التراكيب الوراثية الواعدة من دخن العلف

إبراهيم محمد أحمد ، إبراهيم محمد حسن عوض، شادية مسعد شهوان، عبد العزيز حسن فهمي

قسم بحوث محاصيل العلف – معهد بحوث المحاصيل الحقلية – مركز البحوث الزراعية– الجيزة – مصر

أجرى هذا البحث بهدف دراسة الانتاجية والثبات المحصولي (العلف الاخضر والجاف) لبعض التراكيب الوراثيه من دخن العلف في المحطات البحثية الممثلة لظروف شمال الدلتا (سخا) ، وسط الدلتا (الجميزة) و مصر الوسطى (سدس) و مصر العليا(اسيوط) خلال الموسمين ٢٠٠١،٢٠٠٢. وقدرت ثوابت الأقلمة. وتتلخص النتائج المحصل عليها من هذة الدراسة في الآتي:-

- بالنسبة لمحصول العلف الاخضر و كمتوسط عام لسلوك التراكيب الوراثية في الموسمين كان تفوق التراكيب الوراثية Syn2& SDMV87002 في المحطات البحثية سخا و اسيوط علي الترتيب غير معنوي عن الصنف المقارن بينما كان تفوق التراكيب الوراثية Syn2 & ICMV87101 في المحطات البحثية الجميزة و سدس علي الترتيب معنويا عن الصنف المقارن.
- بالنسبة لمحصول العلف الجاف و كمتوسط عام لسلوك التراكيب الوراثية في الموسمين كانت الفروق بين التراكيب الوراثية المتفوقة SDMV87002 & WCC75 في المحطات البحثية سخا و اسيوط علي الترتيب غير معنوي عن الصنف المقارن بينما كانت الفروق بين التراكيب الوراثية المتفوقة ICMV155 &

Syns.2 في المحطات البحثية الجميزة و سدس علي الترتيب معنويا عن الصنف المقارن.

- كمتوسط عام لسلوك التراكيب الورا ثية في الموسمين و جميع المحطات البحثية لم يلاحظ فروق معنوية بين محصول العلف الاخضر والجاف الكلي للأصناف المتفوقة SDMV87002 & Syn2 وكذلك الصنف المقارن.
- كان التباين الراجع ألي تأثير التراكيب الوراثيه و البيئات وكذلك التفاعل بين التراكيب الوراثية مع البيئات عالي المعنوية لصفتي محصول العلف الأخضر والجاف الكلى.
- كمتوسط عام لجميع التراكيب الورا ثية في المحطات البحثية المختلفة اظهرت النتائج تفوق محصول العلف الاخضر و الجاف الكلي بمحطة بحوث سدس عن المحطات البحثية الاخري .
- بالنسبة لمحصول العلف الاخضر كان معامل الانحدار غير معنوي بالنسبة لجميع التراكيب الوراثية باستثناء التركيب SDMV90011 بينما كان الانحراف عن خط الانحدار معنوي لجميع التراكيب الوراثية عدا U.S.A6.
- وبالنسبة لمحصول العلف الجاف كان معامل الانحدار غير معنوي لجميع التراكيب الوراثية عدا ICMV155 & SDMV90011 & شندويل ١ كما كان الانحراف عن خط الانحدار غير معنوي ايضا بالنسبة لجميع التراكيب الوراثية عدا Syns.1&A.F.POP88 & ICMV 155& شندويل ١.
- مما سبق يتبين ان تحت الظروف البيئية المختلفة كان التركيب الوراثي الواعد U.S.A6 عالي الانتاجية (انتاجيتة لا تزيد عن انتاجية الصنف المقارن) والأكثر ثباتا بالنسبة لمحصول العلف الاخضر كما تبين ان التراكيب الوراثية الواعدة SDMV87002 & ICMV87101 & U.S.A6 & Syns.2 عالية المحصول والأكثر ثباتا بالنسبة لمحصول العلف الجاف الكلى و علي ذلك فالتركيب الوراثي الواعد U.S.A6يمكن ان يوصى باستخدامه و الاستفادة به في جميع برامج تربية دخن العلف.