Phenotypic Stability Analysis, Heritability and Protein Patterns of snake Cucumber Genotypes.

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Abstract: Stability analysis was carried out for six traits in snakecucumber by growing 5 genotypes (1,2,3,4,5) collected from different regions of Egypt (Assiut,Ismialia, El-kalyoubia, Domiat and Fayoom) respectively, in 3 years at El-kassaseen region, Ismailia. Genotypes × environment interaction was significant for all studied traits; the linear component of genotype × environment interaction was significant for number of fruits plant, yield / Fadden and fruit shape index. Environments (linear) were significant for yield / plant, yield / Fadden, fruit diameter and fruit shape index . The linear regression on environmental means (bi) close to unite with significant for genotypes (2,3,5,) for number of fruits / plant and (3,4,5,) for fruit diameter . Broad sense heritability was high for number of fruits / plant, yield / plant, fruit length and fruit shape index, but it was moderate for yield / Fadden and fruit diameter. The figure genotypes showed different patterns in presence of bands, the maximum number of band (6) in genotype (2) and the minimum number (3) was present in genotype (6), there are non resemblance between any genotypes, each genotype was characterized by a unique Finger print, except genotype (2) was monomorphic .
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1. Introduction:

Snakecucumber (Cucumis melo var.flexuosus Naud.) belongs to cucurbits family, preferred to the consumer, it is rich in A, B and C vitamins and contents of iron, calcium, phosphors and zink elements, moreover, it has medical benefits. In spite of, it does not exist on the agriculture map of Ismailia, as other members of its family (melon, squash, watermelon, cucumber). Snakecucumber can be a replacing option for cucumber; its cultivation has been reduced significantly in the late summer season and has been planted under plastic tunnels in the November month or under a greenhouse. The study aimed at the introduction of snakecucumber variety grown in Ismailia, with choice of the most suitable ways to improving of the important snakecucumber genetic traits under conditions of the region. Rare researches on snakecucumber breeding were done if compared with melon. Stability parameters for yield components were described by Gill and Kumar (1989) on watermelon, Yhia (1999) evaluated some of snakecucumber ecotypes for three years under Assiut conditions. Parmer and Lal (2005) and Singh and Lal (2005) studied the genetic variability and heritability for yield traits on muskmelon.

2. Materials and methods

Five genotypes of snake cucumber were collected from different regions of Egypt (Table.1).

Table 1: Serial number of genotypes and its sources

Sources	Serial number of genotypes
Assiut	1
Ismailia	2
Kalyoubia	3
Domiat	4
Fayoom	5

The genotypes were tested at El –Kasaseen research station, Ismailia, during summer seasons of 2005, 2006 and 2007 using a complete randomized block design with 3 replications . Each experimental plot was 15 m long, 150 cm wide and 50 cm a part between hills, all agricultural practices were carried out, by equal and optimum quantities to each plant. Observations were recorded for number of fruits / plant, yield / plant, yield /Fadden, fruit length, fruit diameter and fruit shape index. Stability analysis was carried out following Eberhart and Russell (1966). Heritability in the broad sense was estimated for the former traits, as illustrated by Collins et.al. (1987) according to the following formula,

$H\% = \delta^2 g / (\delta^2 g + \delta^2 m) \times 100$

Coefficient of variability values were estimated depends on phenotypic (P.C.V) and genotypic (G.C.V) variances using the next equations:

$$P.C.V = \sqrt{Vph / \bar{x}} \times 100$$

$$G.C.V = \sqrt{Vg / \bar{x}} \times 100$$

Whereas $\sqrt{Vph}$ = Phenotypic standard deviation.

$\sqrt{Vg}$ = Genotypic standard deviation.

$\bar{x}$ = Genotypes means.

Electrophoresis studies:
Protein electrophoresis

This investigation was carried out at the laboratory of Genetic Department, National Research center. Sodium dodecyl sulphate polyacrylamide gel electrophoresis (SDS-PAGE) was performed according the method of Leammli (1970). After being modified by Studier (1973) the youngest fully expanded leaf samples were taken from each of the four genotypes, (2) Ismailia, (3) Kalyoubia, (4) Domiat and (5) Fayoom. Samples of 0.5 gram of each genotype with 5 ml. of buffer was homogenized, then they centrifuged for 15 minutes at 15000 rpm. Supernatants containing water soluble protein to eppindorf tubes. Incubation and agitation were carried out at room temperature until bands appeared in clear background then the gel was washed with distilled water then gel was photographed Yamamato *et.al* (1982) .

3. Results and Discussion

Differences among genotypes were significant for all the traits, except fruit diameter, indicating the presence of considerable genotypic variation in the germplasm material for these traits (Table 1). The significant mean squares due to environment (years) for all traits suggested that environment (years) considerably influenced on the genotypic performance. The interactions between genotypes and environments for all traits were significant indicating that genotypes behaved differently under different years, this result was in accordance with Gill and Kumar (1989), with respect to yield/plant and number of fruits/plant. Significant mean square due to environments (linear) for yield/plant, yield/Fadden, fruit diameter and fruit shape index indicating the differences between 3 years (environment) and their considerable influence on these traits. The higher linear component of G × E than non-linear component for number of fruits/plant indicates the possibility of production of genotypes in different environments, the mean square due to environment +(G × E)was significant for number of fruits/plant, fruit diameter and fruit shape index. It shows that there was considerable interaction of genotypes with environmental condition in different years. The regression analysis (Table 3)shows that genotypes (2,3,5) had high mean performance for number of fruits/plant with significant regression close to unity (b=1.2,1.4,1.4 respectively), indicating their suitability for all environments. The relatively high values of regression coefficients in genotype 2 (b=3.7) and genotype 4 (b=4.04) with high mean performance for yield/Fadden, reflected the suitability of these genotypes to favorable conditions, like high fertility, timely sowing and good management practices. The S2di values were significant for all genotypes classifying them as unstable for yield/plant, genotype 5 has highest yield/Fadden (8.0 tones) and its bi value is less than 1.0 (b=0.59), revealing its adaptability to unfavorable or poor environmental and management condition. The crooking of snakecucumber fruits that is caused by their excessive length is causing marketing problems. Consequently, that gives importance to the studding of fruit length, diameter and shape index traits. All genotypes under studying were selected on the basis of moderate length. The genotype 4 gives a regularity performance for fruit length, diameter and shape index traits with regression close to unity (b=1.05, 1.1 and 0.99 respectively) and least deviation from regression S2di. The genotypes 2 and 4 could be considered most stable for yield/Fadden; also these genotypes have high yield/Fadden (7.9 and 7.5 tones, respectively). As reported by Perkins and Jinks (1968) and Finlay (1971) the stability like any other character is a heritable trait, thus these two genotypes can be judiciously used in snakecucumber breeding programs as a source of genes for stability and high productivity.

The values of genotypic, phenotypic and error variance, heritability, genotypic (G.C.V) and phenotypic (P.C.V) coefficients of variation are presented in Table (4). For all the studied traits, the genotypic and phenotypic estimated variance appeared large, in comparison with the estimated values of error variance, such a result seemed to indicate that the number of replicates used in the evaluation experiment of these genotypes were adequate to give a better estimation for the error variance. Heritability percentage in the broad sense was found moderate values for number of fruits/plant, yield/Fadden and fruit diameter as appears in Table (3). Accordingly, it might be stated that phenotypic selection for these traits would be reasonably effective. The higher estimated heritability values for yield/plant, fruit length and fruit shape index indicating that phenotypic selection for these traits could be highly efficient. These results were in harmony with those obtained by Parmar and Lal (2005) and Singh and Lal (2005).

The estimations of genotypic (G.C.V) and phenotypic (P.C.V) coefficients of variation exhibited small differences between genotypic and phenotypic coefficient of variation for yield/plant, fruit length and fruit shape index, revealing that environmental effects were not great importance on these traits. These results were assured by heritability values

Protein electrophoresis:

The four genotypes showed different patterns in presence of bands (Fig 1 and Table 5), the maximum number of band (6) in(Ismailia 2) and the minimum number (3) was present in (Fayoom5)and (Kalyoubia). However, there are non resemblance between any genotypes each genotype was characterized by a unique fingerprint except for genotype (Ismailia2) was monomorphic. At the same time there was a marker band (5) for some genotypes such as band 2 at 49 KD for genotype (Fayoom 5), band 5 at M.W 39 KD for genotype (Domiat4). These results were in agreement with Jurgen and Helmut (1978) who confirmed that SDS- protein page was a highly successful technique in genotype identification Staub *et al*. (1983) reported that electrophresis employed as enzymatic for studying breeding material in the genus and taxonomy of cucumber.In relation to number and intensity of bands, genotypes (Ismailia 2) and (Domiat4) had the same number groups of bands with more intensity than other genotypes (Kalyoubia 3 and Fayoom 5).From the previous results, it could be deduced that the variation in banding patterns between four genotypes; showed different behavior for genotypes under Ismailia conditions, whereas genotypes (Ismailia 2 and Domiat 4) were more adaptation, and confirm that these four genotypes are genotipically and evolutionary different.

Table (2) Estimations of mean squares of six traits in snakecucumber.

		Mean squares					
Source of variation	d.f	Number of fruits / plant	Total yield /plant (kg)	Total yield /Fadden (ton)	Fruit length (cm)	Fruit diameter (cm)	Fruit shape index
Environmental (years)	2	66.3**	0.33**	0.67*	119.7**	9.45**	8.9**
Genotypes	4	2.9**	0.14**	0.53*	13.3**	0.04	1.5**
Genotypes × Environments	8	3.61*	0.13**	1.14**	10.67**	0.097*	1.7**
Environment + (Genotype × environment)	10	5.38**	0.04	0.33	10.74	0.661**	1.03**
Environmental (linear)	1	1.1	0.84**	0.91*	1.0	1.01**	1.0**
Genotype×Environmental(linear)	4	12.87**	0.009	0.613*	1.53	0.028	2.32**
Pooled deviation	5	.24	0.098	0.09	4.44	0.02	0.01
Pooled error	30	1.4	0.003	0.16	1.3	0.06	0.4

P*≤ 0.05, P**≤ 0.01

Table (3) Estimation of stability parameters for six traits in snakecucumber

Genotypes	Number of fruits/plant			Total yield/plant (kg)			Total yield/Fadden (ton)			Fruit length (cm)			Fruit diameter (cm)			Fruit shape index		
	X	(bi)	S^2di	X	(bi)	S^2di	X	(bi)	S^2di	X	(bi)	S^2di	X	(bi)	S^2di	X	(bi)	S^2di
1	4.4	0.6**	-0.5	1.6	1.04	0.05**	7.5	-2.2	-0.1	20.9	1.38*	1.14	3.5	0.96**	-.01	6.0	0.95**	-.05
2	4.7	1.2**	-0.5	1.5	0.64	0.40**	7.9	3.7*	-.01	18.8	1.2	12.4**	3.5	0.79**	-.02	5.4	-.51**	-.09
3	5.1	1.4**	0.1	1.7	1.36	0.03**	7.6	-0.4	-0.1	21.61	0.65	5.7*	3.5	1.02**	-.01	6.4	1.83**	0.01
4	4.0	0.36*	-0.2	1.6	-.88	0.12**	7.5	4.04**	0.1	20.0	1.05	0.52	3.7	1.1**	0.03	5.6	.99**	-.08
5	5.5	1.4**	0.7	1.8	1.5	0.24**	8.0	0.59	0.12	19.0	0.72	0.33	3.4	1.13**	0.0	5.8	1.85**	-.12

X=Mean, bi=Regression coefficient, S^2di=Deviation from regression P*≤0.05, p**≤0.01
1=Assiut, 2=Ismailia, 3=Kalyoubia, 4=Domiat, 5=Fayoo

Table (4) Genotypic (δ2 g), Phenotypic (δ2ph) and error variances (δ2e) , Heritability (H%) in the broad sense and Genotypic(G.C.V) and Phenotypic(P.C.V) coefficients of variation estimates for six traits in snakecucumber.

Traits	Genotypic variation(δ^2g)	Phenotypic variation(δ^2ph)	Error variation(δ^2e)	Heritability (H%)	(G.C.V)	(P.C.V)
Number of fruits/plant	2.9	4.26	1.4	68.08	35.9	43.7
Total yield/plant	0.14	0.184	0.003	76.09	23.4	24.0
Total yield/Fadden	0.53	0.933	0.21	56.81	9.5	11.2
Fruit length	13.3	17.0	1.3	78.24	18.2	19.1
Fruit diameter	0.04	0.079	0.06	50.63	5.7	9.0
Fruit shape index	1.5	2.11	0.4	71.09	21.1	23.8

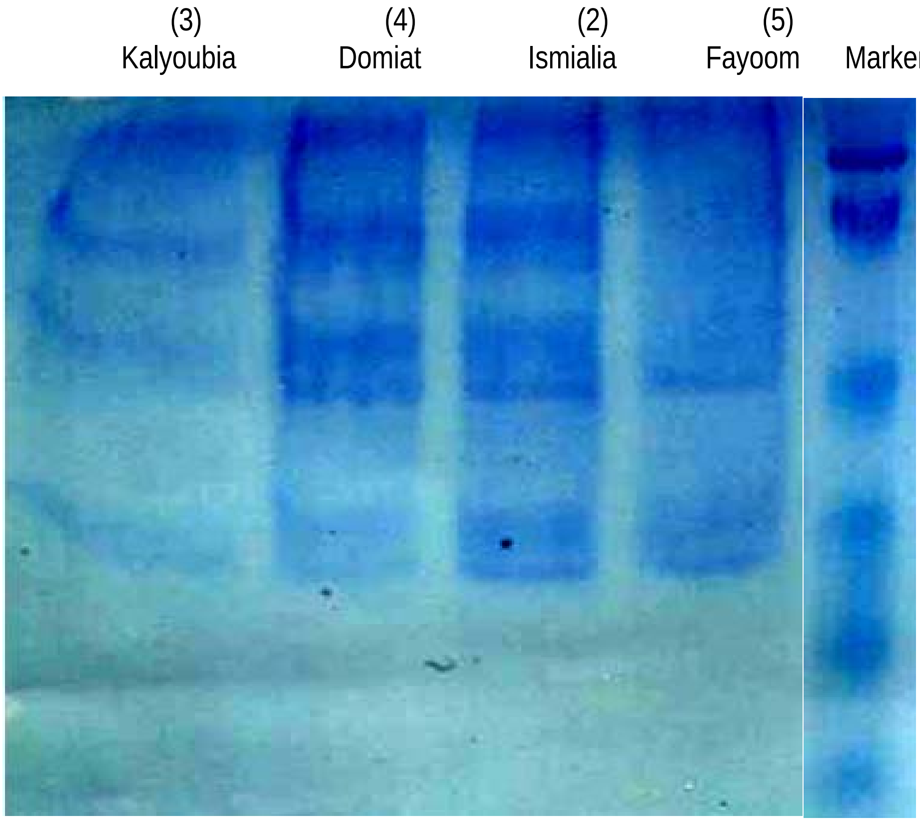

Fig1: Gel photographed of Sodium dodecyl sulphate polyacrylamide gel electrophoresis (SDS. PAGE) of snakecucumber genotypes

Table (5) Analysis of bands for gel photographed of Sodium dodecyl sulphate polyacrylamide gel electrophoresis (SDS. PAGE) of snakecucumber genotypes

No. of Band	MW	Genotypes			
		5	2	4	3
1	50	0	1	1	0
2	49	0	1	1	1
3	46	0	1	1	1
4	40	1	1	1	0
5	39	1	1	1	0
6	36	1	1	0	1
Total		3	6	5	3

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4. References:

1. Collins, W.W.; L.G.Wilson; S.Arrendell and L.F.Dicky (1987). Genotype×environment interaction in sweet potato yield and quality factors. J. Amer. Soc. Hort. Sci. 112 (3): 579 – 589.
2. Eberhart, S.A. and W.A.Russell (1966). Stability parameters for comparing varieties. Crop Science 6 : 36 – 40.
3. Finlay, K.W. (1971). Breeding for yield in barley. Proceedings of international barley genetic symposium 2 : 345 – 388.
4. Gill, B.S. and J.C.Kumar (1989). Phenotypic stability in watermelon. Indian journal of agricultural sciences 59 (3) : 145 – 148.
5. Jurgen,F. and K.L. Helmut (1978) plant micro body proteins European journal of Biochemistry volume 92 issue 1 , December (1) , : 35 – 43
6. Laemmli,U.K. (1970) . Cleavage of structural prteins during the assembly of the head of bacteriophage T4. Nature. 227 : 680 – 685 .
7. Parmar, A.M. and T.Lal (2005). Variability studies in melon. Research on crops 6 (2) : 314 – 317 Hisar, India.
8. Perkins, J.M. and J.L. Jinks (1968). Environmental and genotype environmental components of variability. □. Multiple lines and crosses. Heredity, London. 23: 339 – 356.
9. Singh, G. and T. Lal (2005). Genetic variability, heritability and genetic advance for yield and its contributing traits in muskmelon. Journal of research. Punjab agricultural Univ. India 42 (2): 168 – 174.
10. Staub,J.E.; R.S. Kupper, and T.C. wehner (1983) preliminary of isozyme polymorphism in cucumes cucurbit genetics cooperative report 6 : 32–34 (article 16).
11. Studier,F.W. (1973). Analysis of bacteriophage T1 early RNAs and proteins of slab gels .J. Mol. Bio., 79: 237 – 248
12. Yamamato, K.O.; Maitani and Ando (1982). Karyotypic and isozymatic polymorphism in species of the section faba (Genus vicia). Tech. Bull- Fac. Agric. Kagawa Univ., 34:1-10
13. Yahi, A.M. (1999). The performance of some snakecucumber ecotypes under Assiut conditions. M.Sc. Thesis, Fac. Agric. Assiut Univ., Egypt.

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