Electronic Journal of Plant Breeding, 9 (2) : 538-542 (June 2018)
ISSN 0975-928X
DOI: 10.5958/0975-928X.2018.00065.0

Research Article

Generation mean analysis for quality characters in yard long bean (*Vigna unguiculata subsp. sesquipedalis* (L.) Verdcourt)

E. G. Merin*, S. Sarada and I. Sreelathakumary
Department of Vegetable Science, College of Agriculture, Vellayani- 695 522, Kerala.
E-Mail: merinelzageorge5010@gmail.com

(Received: 25 May 2018; Revised: 29 Jun 2018; Accepted: 02 Jul 2018)

Abstract
Generation mean analysis in yard long bean was undertaken to estimate the gene action operating in the inheritance of quality characters pod protein (%) and keeping quality (% weight loss). Six basic generations *viz.*, P_1, P_2, F_1, F_2, BC_1 and BC_2 of two crosses, namely Kakkamoola Local x Githika (cross 1) and Kakkamoola Local x Vellayani Jyothika (cross 2) were studied. Significance of scaling test revealed the presence of epistasis for characters under investigation. The predominance of dominance component for the characters under study indicates the improvement of the traits through heterosis breeding.

Keywords
Yard long bean, Gene action, Generation mean analysis, Pod protein, Keeping quality

Introduction

Yard long bean (*Vigna unguiculata* subsp. *sesquipedalis* (L.) Verdcourt) vernacularly known as 'Achingapayar', 'Kurutholapayar', 'Vallipayar', etc., is one of the most popular and remunerative vegetable crop traditionally grown in Kerala. It is widely grown in China, South and South East Asia. It is cultivated mainly for crisp and tender pods that are consumed both fresh and cooked. It is called as 'vegetable meat', being a rich and inexpensive source of vegetable protein. Pod protein content in vegetable cowpea is a complex trait governed by polygenic inheritance, affected by environment Singh and Dabas(1992). The study was conducted to understand the mode of inheritance of the quality components and choice of breeding methodology for developing elite varieties in yard long bean

Materials and Method

The present investigation was carried out at Department of vegetable science, College of Agriculture,Vellayani,Kerala from 2017 to 2018. The experiment was carried out in three parts. The six generaations from two cross combinations Kakkamoola Local x Githika (cross1) and Kakkamoola Local x Vellayani Jyothika were raised in Randomized Block Design with spacing 1m x 1m. Five plants from each treatment for the in P_1, P_2, F_1 generations were randomly selected and tagged and ten no plants from F_2, BC_1 and BC_2 generations for the two characters under study was selected and subjected to generation mean analysis Hayman(1958) followed by scaling test (Mather, 1949). Pod Protein (%)Pod Protein was estimated by Lowry method, developed by Lowry *et al.* (1951). The method is sensitive enough to give a moderately constant value and hence largely followed.

Keeping Quality (% weight loss)

Keeping quality was determined to study the shelf life and number of days the pods remained fresh for consumption, without loss of colour and glossiness. It is estimated in terms of physiological loss of weight *i.e.*, loss of weight that occur every day was calculated and average was taken. Weight of harvested pods of all treatments kept under ordinary room condition was taken every day at a fixed time for five consecutive days.

$$\text{Physiological loss of weight} = \frac{\text{Initial weight} - \text{Final weight}}{\text{nitial weight}} \times 100$$

Results and Discussion

Yard long bean is a rich and inexpensive source of vegetable protein and hence pod protein (%) is an important quality parameter. The effect of 'm' was positively significant in both the crosses, hence there was significant difference among the generations (Table 1 and Fig. 1). Pod protein content was maximum in BC_1 generation (6.23 % and 6.27 % respectively) for the cross 1 (VS 50 X VS 34) and 2 (VS 50 X VS 26), but minimum in P_2 in cross 1(VS 50 X VS 34) and 2 (VS 50 X VS 26) (4.55 % and 4.43 % respectively). Significance was observed for

DOI: 10.5958/0975-928X.2018.00065.0

all scales during scaling test except scale D in cross 2 (VS 50 X VS 26), among which scales A, B and C were acting in favourable positive direction and scale C having the highest magnitude which indicates the superiority of F_2 over the parents in cross 1 (VS 50 X VS 34) and 2 (VS 50 X VS 26). Detailed analysis of genetic components showed positive significance of additive, dominance, additive x dominance and negative significance of additive x dominance and dominance x dominance type of epistasis, of which dominance possessed the highest positive value in both the crosses, which indicates the improvement of the trait protein through heterosis breeding. Dominance variance component was positively significant for pod protein content. Preponderance of non-additive gene action for pod protein content was observed in accordance with earlier reports of Malarvizhi (2002), Noubissie *et al.* (2011) and Subbaih *et al.* (2013).

Cultivation of yard long bean for commercial market requires pods having longer keeping quality, without losing the freshness and tenderness. So keeping quality measured in terms of percentage weight loss is an important quality parameter considered for crop improvement. Significant variation was observed among the generations for keeping quality as shown by the significant value of 'm' in both the crosses (Table 1 and Fig. 2). Best keeping quality was for BC_2 generation in cross 1 (VS 50 X VS 34) (14.16 %) and cross 2 (VS 50 X VS 26) (16.88 %). Lowest keeping quality was observed in the common parent P_1 (25.08 %) in both the crosses. Scales A, B and C were significant and negative in both the crosses, whereas scale D was positively significant. Scale C had the highest magnitude in the favourable negative direction, which implies the superiority of F_2 over the parents. Detailed study of genetic components showed significance in negative direction in dominance, additive x additive and additive x dominance while additive and dominance x dominance had positive significance. Dominance effect had the highest magnitude in the favourable negative direction, which suggested heterosis breeding for the improvement of the trait in cross 1 (VS 50 X VS 34). In cross 2 (VS 50 X VS 26), significance was observed for all the genetic components of which dominance and additive x additive interactions were in the favourable negative direction and dominance had the highest magnitude. Hence heterosis breeding can be utilized for the improvement of keeping quality of pods in cross 2 (VS 50 X VS 26). Garg *et al*. (2008) in tomato and Lakshmi (2016) in vegetable cowpea attributed the predominance of non-additive gene action for inheritance of keeping quality of pods.

The predominance of dominance component for pod protein and keeping quality in yard long bean indicates the improvement of the traits through heterosis breeding.

References

Garg, N., Cheema, D.S., and Dhatt, A.S. 2008. Genetics of yield, quality and shelf life characteristics in tomato under normal and late planting conditions. *Euphytica,* **159** (1-2): 275-288.

Hayman, B. 1958. The separation of epistatic from additive and dominance variation in generation means. *Heredity,* **12***:* 371-390.

Lakshmi, K. M. 2016. Development of hybrids in yard long bean (*Vigna unguiculata* subsp. *sesquipedalis* (L.) Verdcourt). M.Sc. (Hort) thesis, Kerala Agricultural University, Thrissur, 133p.

Lowry, O.H., Rosebrough, N.J., Farr, A.L., and Randall, R.J. 1951. Protein measurement with the Folin phenol reagent. *J. Biol. Chem.,* **193** (1): 265–275.

Malarvizhi, D. 2002. Genetic variability, heritability and genetic advance for leaf, pod and seed protien in cowpea (*Vigna unguiculata* (L.) Walp.). *Legume Res*., **25**: 196-198.

Mather, K. 1949. *Biometrical Genet.* Methuen and Co. Ltd., London

Noubissie, J.T., Youmbi, E., Njintang, N.Y., Alladoum, A.N., Nguimbou, M.R., and Bell, J.M. 2011. Genetic architecture of some leaf yield and quality attributes in dual purpose cowpea (*Vigna unguiculata* (L.) Walp.). *Am. J. Exp. Agric*., **1** (4): 400-413.

Singh, R. and Dabas, D.S. 1992. Inheritance of yield and its components in cowpea (*Vigna unguiculata* (L.) Walp). *Indian J. Trop. Agric*., **4**: 85-87.

Subbiah, A., Prabhu, M., Rajangam, J., Jagadeesan, R., and Anbu, S. 2013. Genetic analysis of vegetable cowpea [*Vigna unguiculata* (L.) Walp.]. *Legume Res*., **36** (1): 1-9.

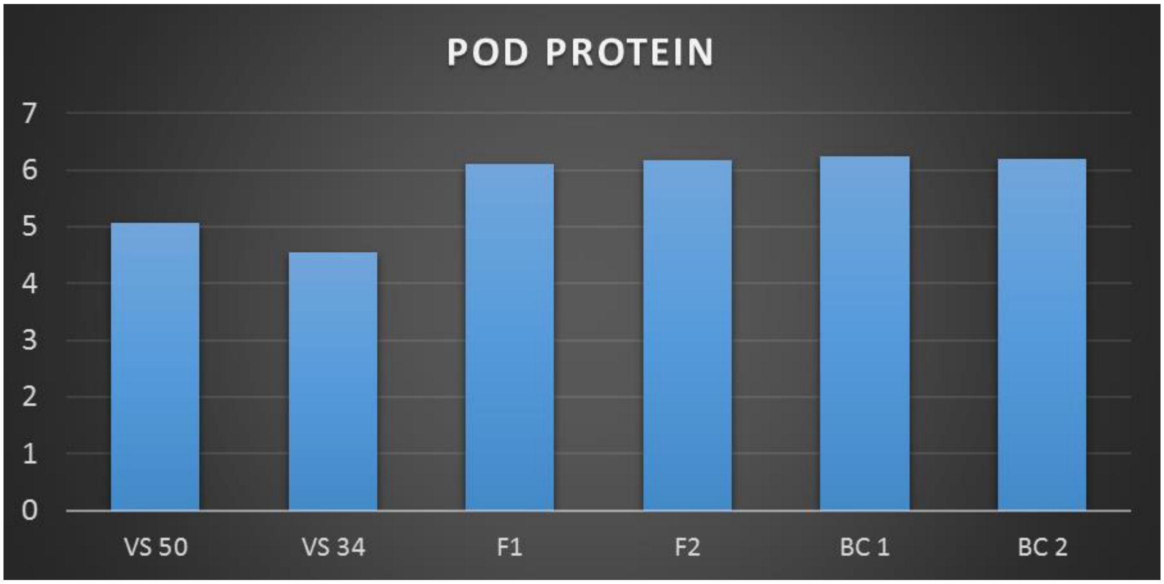
Electronic Journal of Plant Breeding, 9 (2) : 538-542 (June 2018)
ISSN 0975-928X
DOI: 10.5958/0975-928X.2018.00065.0

Table 1. Generation means (±SE), Scale values (±SE), and estimates of genetic components (±SE) for pod protein (%) and keeping quality (% weight loss) in yard long bean

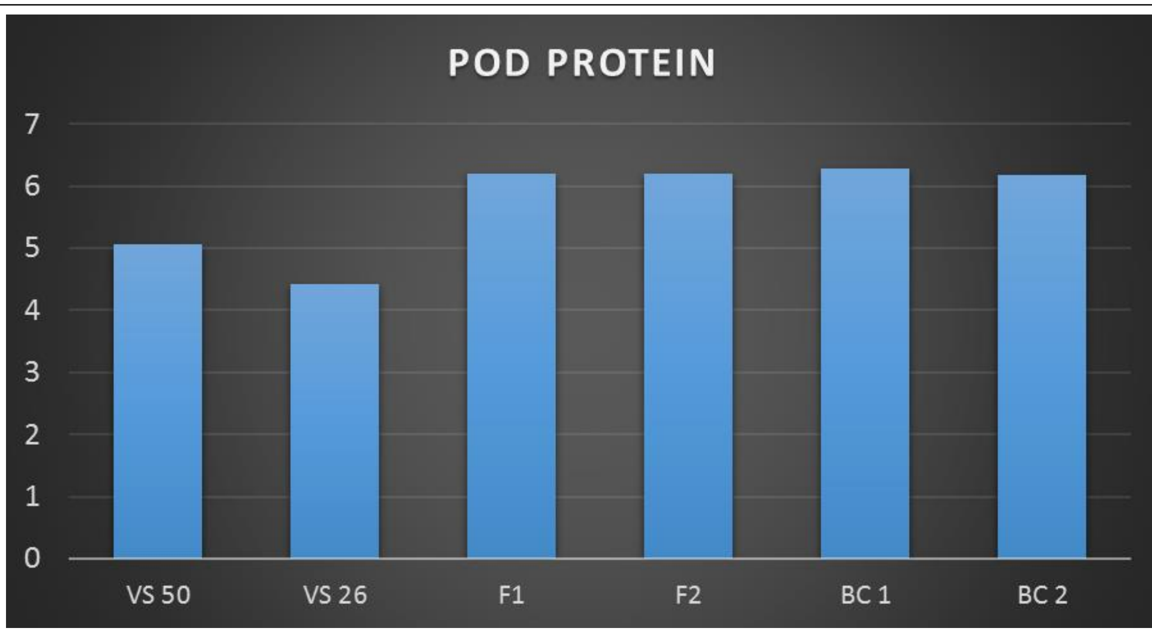
	Pod protein (%)		**Keeping quality (% weight loss)**	
	Cross 1 (VS 50 X VS 34)	Cross 2 (VS 50 X VS 26)	Cross 1 (VS 50 X VS 34)	Cross 2 (VS 50 X VS 26)
Generation means				
P_1	5.07 ± 0.004	5.07 ± 0.004	25.08 ± 0.29	25.08 ± 0.29
P_2	4.55 ± 0.03	4.43 ± 0.03	19.85 ± 0.19	21.87 ± 0.52
F_1	6.11 ± 0.03	6.19 ± 0.004	16.44 ± 0.12	17.82 ± 0.19
F_2	6.16 ± 0.02	6.19 ± 0.002	15.59 ± 0.23	17.72 ± 0.06
BC_1	6.23 ± 0.03	6.27 ± 0.02	14.37 ± 0.17	17.40 ± 0.12
BC_2	6.19 ± 0.02	6.18 ± 0.04	14.16 ± 0.04	16.88 ± 0.08
Scale values				
A	1.28* ± 0.06	1.27* ± 0.05	-12.77* ± 0.47	-8.10* ± 0.41
B	1.71* ± 0.06	1.75* ± 0.09	-7.97* ± 0.24	-5.93* ± 0.58
C	2.80* ± 0.09	2.89* ± 0.04	-15.47* ± 1.02	-11.70* ± 0.74
D	-0.10* ± 0.05	-0.07 ± 0.05	2.64* ± 0.50	1.17* ± 0.18
Genetic components				
m	4.61* ± 0.09	4.62* ± 0.10	27.74* ± 1.01	25.81* ± 0.46
d	0.26* ± 0.02	0.32* ± 0.02	2.61* ± 0.17	1.60* ± 0.30
h	4.69* ± 0.24	4.71* ± 0.29	-37.31* ± 2.21	-24.35* ± 1.31
i	0.20* ± 0.09	0.13 ± 0.09	-5.27* ± 0.10	-2.33* ± 0.35
j	-0.43* ± 0.08	-0.48* ± 0.10	-4.79* ± 0.49	2.16* ± 0.66
l	-3.19* ± 0.17	-3.15* ± 0.19	26.01* ± 1.25	16.36* ± 0.92
Epistasis	D	D	D	D

D: Duplicate type of epistasis
SE: Standard Error
Cross 1: VS 50 X VS 34
Cross 2: VS 50 X VS 26
*Significant at 5% level

Electronic Journal of Plant Breeding, 9 (2) : 538-542 (June 2018)
ISSN 0975-928X
DOI: 10.5958/0975-928X.2018.00065.0



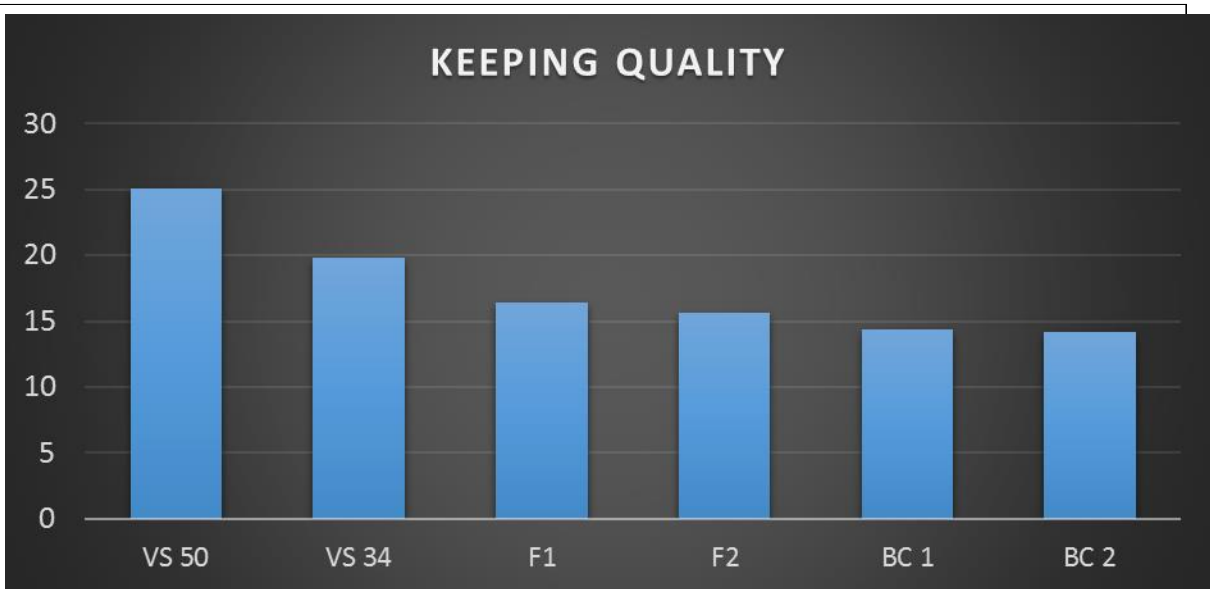
CROSS 1 (VS 50 X VS 34)



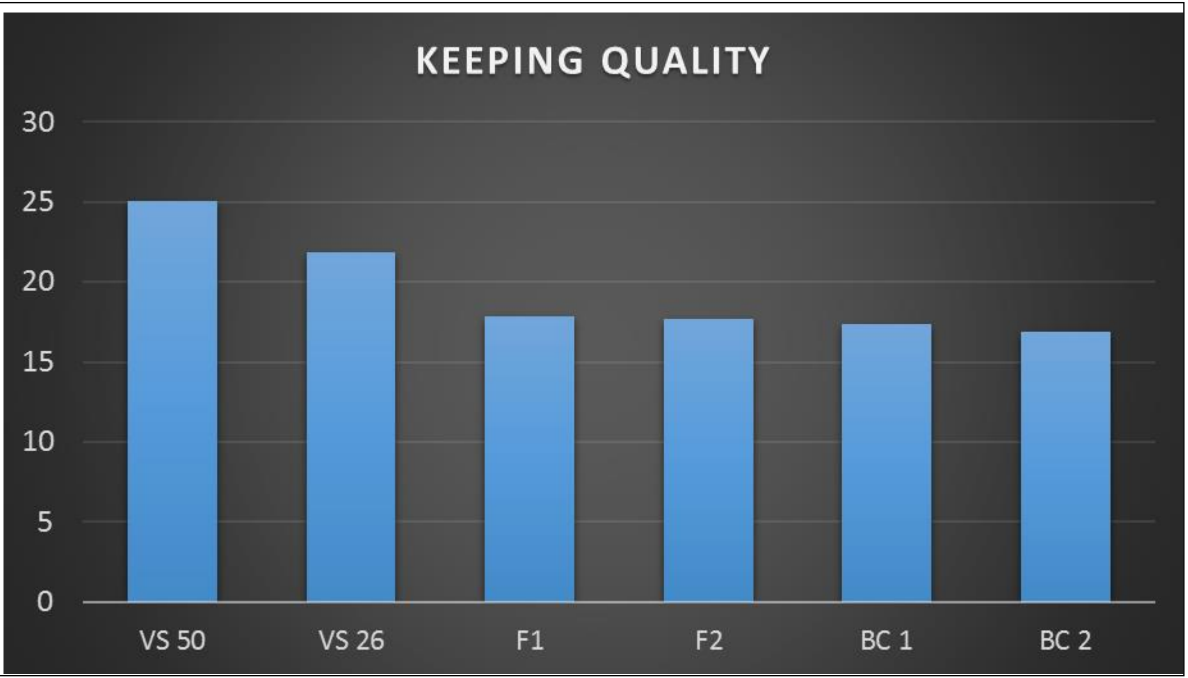
CROSS 2 (VS 50 X VS 26)

Fig. 1. Variability for pod protein (%) among the generations in cross 1 and cross 2

Electronic Journal of Plant Breeding, 9 (2) : 538-542 (June 2018)
ISSN 0975-928X
DOI: 10.5958/0975-928X.2018.00065.0



CROSS 1 (VS 50 X VS 34)



CROSS 2 (VS 50 X VS 26)

Fig. 2. Variability for keeping quality (% weight loss) among the generations in cross 1 and cross 2