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# PLAN FOR BREEDING, MAINTENANCE AND PRODUCING THE NUCLEOLUS (BREEDER'S SEED) OF GIZA 45 EGYPTIAN COTTON VARIETY DURING 2011 – 2014 GROWING SEASONS



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## ABSTRACT

The breeding program of Giza 45 was conducted at Sakha Agricultural Research Station, Kafr El-Sheikh district during 2011 to 2014 growing seasons. In 2011 season 42 type plants were selected from the breeding field of Giza 45 variety and furnished ٤٢ progenies (increase A) in 2012. From the latter, fourteen families were selected to descend (increase B) in 2013. According to the statistical analysis of yield trial which include the fourteen families and comparisons of the latest lines of Giza 45, four elite families were selected and the seeds were carefully massed together to form the nucleolus (breeder's seed) in 2014 season. The results obtained here indicated that, the pure line method in the sense of pedigree selection for renewing annually Giza 45 breeder's seed could produce high genetic pure seeds and in the same time, prevent genetic contamination. Meanwhile, the selection technique for producing breeder's seed of Giza 45 variety was valid and proved to be effective in holding this variety according to the standard type of Giza 45. Genetic purity, Maintenance ,cotton nucleolus .

## INTRODUCTION

Egyptian cotton (*G. barbadense* L.) is considered the best fiber crop in the world and remains as one of the most important crop in Egypt. Supplying pure cotton seeds to farmers involves three co-operative administration 1- Cotton Varietal Maintenance Research Department, Cotton Research Institute (C.R.I.), 2- Central Administration For Seed Production (C.A.S.P.) and 3- Central Administration For Seed Certification (C.A.S.C.). (Lewis l970) indicated that varietal maintenance of the Egyptian cotton varieties played an important role in the breeding programs with the fact that high quality properties are the principal merit of Egyptian cotton, will deteriorate unless an effort is made to maintain it. Abd El Salam (2000) found that differences among the strains of cultivars after general use and their corresponding pure line were significant for lint yield of Giza 86,while highly significant for lint percentage of Giza 70,Giza 85 and Giza 86.In Egypt, after new cotton variety was developed by the breeders (Cotton Breeding Research Department , Cotton Research Institute (C.R.I.), it should be subjected to scientific system for producing the new varieties. The scheme of breeding based on pure line method is used pedigree selection method to renewing and maintaining the breeder's seed of the cotton cultivars for commercial use. Maintenance of the Egyptian cotton varieties have been reported by many workers, Ware (1959), Turner (1963) Walker (1964) and Riggs (1967) studied a model bulk system designed to stabilize a variety. They concluded that this system could be considered as a good maintenance procedure for a variety already released.

Al-Didi (1974) stated that it was advantageous to mass the seed of chosen progenies in which the seed mixture may respond differently to environmental variation. He added that, if genotype x environment effects were significant, mixture of seeds might show less fluctuation in yield and quality than individual progenies. Also, El-Akkad *et al.* (1982), El-Kilany and Youssef (1985), Younis *et al.* (1993), Abo-Arab *et al.* (1995), Lasheen (1997), El-Disouqi (2001), Nagib and Hemida (2001) , Abdel-Zaher (2004) and Mohamed (2013) applied breeding and production series of long and extra long staple varieties, by using the pedigree selection method to produce, renew and maintain the breeder's seed of the cotton cultivars for commercial use. The present method of maintaining Egyptian cotton varieties is the pedigree method based on massing selfed seeds of several plants according to their performance in evaluation with the latest nuclei. Therefore, the main objective of the present study is to follow the steps of renewing and maintaining the breeder's seed of *G*iza 45,during 2011-2014 growing seasons.

## MATERIALS AND METHODS

*G*iza 45 is an extra long cotton variety grown in Delta Egypt region at beginning fifties to first their millennium, this variety is higher fiber length about 36 – 37 mm, this variety was a result of the pedigree selection method from the hybridization between Giza 28 and Giza 7 cotton varieties. The base population used in the present study was grown in 2011 in nursery . The plants were screened for testing yield and its components characteristics (boll weight, seed index and lint percentage) as well as fiber properties (fiber length, fineness and strength). 42 type plants representing the type of Giza 45 variety were selected, in 2012 season to furnish the increase lines A in 2012 season. Independent culling level selection was applied for most characters, this means that the selection procedure for producing breeder seed of Giza 45 variety was valid and proved to be effective in holding this variety according to the standard type of Giza 45.

In 2012 season, the selfed seeds of the 42 selected type plants were grown in number of rows as allowing amount of seed conveniently named increase lines A, as well as the natural pollinated seeds of the same 42 selected type plants were grown in adjacent progeny rows to be used in yield trial in the next year. Accordingly the field and laboratory tests of phenotypic yield and its components and fiber properties fourteen families were selected from increase A at, the end of season 2012.

In 2013 season, the selfed seeds of the 14 families were grown in increase B. A yield trial includes the fourteen selected families, as well as two latest strains of Giza 45 namely, nucleus were used as controls. This yield trial was conducted at Sakha Agricultural Research Station. The design of yield trial was a randomized complete block design with four replications. The sixteen entries were evaluated for yield and its components and fiber properties i.e. fiber length, fineness and strength.

In 2014 season, the four best families were selected from increase B and their selfed seeds were carefully massed together to form the new

nucleolus (breeder's seed) of Giza 45 variety and propagated in 2014 under this name season in about 8 feddan at Sakha Agricultural Research Station.

**Data were recorded in this study for the following traits:**

**Yield components characters are:**

1- Seed cotton yield (S.C.Y. /P.) in K**. /**F**.**
2- Lint cotton yield (L.C.Y. /P.) in K**. /**F**.**
3- Boll weight (B.W.) in gm.
4-Lint percentage (L.P. %)
5-Seed index (S.I.) in gm.
6-Lint index (L.I.) in gm.

**Fiber properties traits are:**

1- Fiber length (F.L.) Fiber length 2.5% in m.m.
2- Fiber fineness (F.F.) Micronaire reading.
3-Fiber strength (F.S.) Pressily index, Strength g/tex (ST.g/tex) and Yarn strength (Yarn stern.).
4- Uniformity ratio (U.R. %).
5- Elongation (Elon.).
6- Yellowness (+ b)
7- Brightness (RD %).

Analysis of variance was conducted for all the characters in the yield trial and tested for significance by "F" test.

Mean of selected families, mean of comparisons, standard error and coefficient of variability (C.V. %) was executed for all characters.

## RESULTS AND DISCUSSION

Means of agronomic characters and fiber properties for the selected 42 of Giza 45 variety in 2012 seasons(table1) were estimated. It could be noticed that, the means of families (increase A) were equal with the means of comparisons for most traits, except for lint percentage and fiber length 2.5% in mm. , fiber strength in g/tex and elongation traits which exhibited by selection better values than the means of comparisons. Coefficient of variability as indicated by coefficient of variability (C.V. %) decreased for most the studied characters after selection, indicating gene fixation beside improvement. Assimilate the lowest of the coefficient of variability values which indicates that the selection play a big role in these characters, making it one of the most important characters in Cotton Varietal Maintenance Department , Cotton Research Institute (C.R.I.). Giza 45 selected increase A type families in final of 2012 growing season.

The results in Table 2 are show means of yield, yield components and fiber properties for ١٤ selected families ( increase B) compared with the latest strains of *G*.45 (control). The results showed that no significant differences were detected among the families and control for all the studied characters except for cotton yield , lint percentage and lint index. The results are in agreement with those obtained by Abo-Arab *et al.,* (1995), Lasheen (1997), El-Disoqui (2001), Nagib and Hemida (2001) , Abdel-Zaher (2004) and Mohamed (2013) .

**Table 1: Mean of agronomic and fiber properties for the 42 selected increase A families in 2012 season.**

| Families No. | Boll weight g. | Lint percent% | Lint index g. | Seed index g. | Fiber length 2.5% mm | Mic. | Lint Color | | Strength g/tex | Yarn strength 60's carde |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | Rd % | +b | | |
| 1/2011-1 | 2.676 | ٣٢.٧ | ٤.٦٥ | ٩.٥٥ | ٣٦.١ | 3.2 | 72.3 | 9.7 | ٤٨.٧ | 3240 |
| 1/2011-2 | 3.092 | ٣٣.٢ | ٤.٩٠ | ٩.٨٥ | ٣٥.٩ | 3.2 | 74.5 | 9.7 | 44.9 | 3110 |
| 1/2011-6 | 2.804 | ٣٤.٢ | ٥.٢٢ | ١٠.٠٥ | ٣٦.٤ | 3.2 | 74.9 | 9.6 | 48.4 | 3170 |
| 2/2011-1 | 2.924 | ٣٢.٩ | ٥.٠١ | ١٠.٢ | ٣٦.٤ | 3.1 | 76.0 | 9.9 | 48.5 | 3240 |
| 2/2011-2 | 2.732 | ٣٠.٩ | ٤.٦٤ | ١٠.٤ | ٣٦.٤ | 3.2 | 77.1 | 10.0 | 45.5 | 3140 |
| 2/2011-3 | 2.944 | ٣٠.٥ | ٤.١٢ | ٩.٤٠ | ٣٦.٨ | 3.2 | 76.4 | 9.3 | 46.0 | 3100 |
| 2/2011-4 | 2.196 | ٣١.١ | ٤.٣١ | ٩.٥٥ | ٣٥.٩ | 3.2 | 76.4 | 10.0 | 46.1 | 3150 |
| 3/2011-1 | 3.448 | ٣٢.٣ | ٤.٨٣ | ١٠.١٥ | ٣٦.٥ | 3.3 | 76.4 | 9.5 | 46.3 | 3130 |
| 3/2011-2 | 3.024 | ٣١.٤ | ٤.٧٦ | ١٠.٤٠ | ٣٥.٠ | 3.1 | 75.3 | 9.3 | 47.6 | 3160 |
| 8/2011-2 | 2.976 | ٣٢.٤ | ٤.٩٦ | ١٠.٣٥ | ٣٦.٧ | 3.3 | 75.4 | 9.6 | 46.9 | 3190 |
| 8/2011-3 | 2.94 | ٣٢.٦ | ٥.٢٧ | ١٠.٩٠ | ٣٥.٣ | 3.2 | 75.6 | 10.0 | 49.1 | 3260 |
| 8/2011-6 | 3.084 | ٣٢.٨ | ٥.١٦ | ١٠.٥٥ | ٣٦.٠ | 3.2 | 74.5 | 9.5 | 48.5 | 3180 |
| 17/2011-1 | 3.308 | ٣٠.٠ | ٤.٣٥ | ١٠.١٥ | ٣٦.٤ | 3.2 | 75.2 | 9.5 | 49.1 | 3210 |
| 17/2011-2 | 2.524 | ٣٠.٥ | ٤.١٥ | ٩.٤٥ | ٣٥.٤ | 3.0 | 75.5 | 9.0 | 48.4 | 3180 |
| 17/2011-4 | 2.464 | ٢٩.٦ | ٤.٣١ | ١٠.٢٥ | ٣٦.٠ | 3.2 | 75.1 | 9.7 | 47.3 | 3180 |
| 17/2011-6 | 2.228 | ٣١.٥ | ٤.٨٨ | ١٠.٦ | ٣٦.٢ | 3.1 | 74.9 | 9.5 | 45.2 | 3150 |
| 17/200117 | 2.312 | ٣١.٦ | ٤.٧٨ | ١٠.٣٥ | ٣٥.١ | 3.2 | 76.0 | 9.9 | 49.4 | 3200 |
| 18/2011-5 | 2.624 | ٢٨.٢ | ٣.٩٣ | ١٠.٠ | 35.5 | 3.2 | 75.0 | 9.5 | 47.1 | 3100 |
| 19/2011-2 | 2.404 | ٣١.٧ | ٥.١٨ | ١١.١٥ | 35.8 | 3.0 | 74.0 | 10.0 | 47.9 | 3080 |
| 25/2011-2 | 2.248 | ٣١.٢ | ٤.٧٨ | ١٠.٥٥ | 35.4 | 3.2 | 73.4 | 10.0 | 45 | 2965 |
| 25/2011-3 | 2.476 | ٣٣.٣ | ٥.٠٥ | ١٠.١ | 36.2 | 3.2 | 76.5 | 9.9 | 49.2 | 3285 |
| 25/2011-5 | 2.424 | ٣٤.٧ | ٥.٤٤ | ١٠.٢٥ | 36.0 | 3.2 | 78.2 | 9.8 | 47.9 | 3190 |
| 25/2011-9 | 2.432 | ٣٢.٣ | ٥.١٣ | ١٠.٧٥ | 36.4 | 3.2 | 76.0 | 9.8 | 47.4 | 3110 |
| 26/2011-3 | 2.228 | ٣٢.٩ | ٥.١٩ | ١٠.٦ | 36.4 | 3.4 | 75.1 | 9.8 | 48.5 | 3195 |
| 26/2011-6 | 2.336 | ٣١.٥ | ٤.٧٥ | ١٠.٣٥ | 36.0 | 3.2 | 75.7 | 9.5 | 46.7 | 3090 |
| 26/2011-7 | 2.292 | ٣١.٥ | ٥.٣٩ | ١١.٧ | 35.8 | 3.3 | 74.5 | 9.7 | 47.2 | 3175 |
| 26/2011-8 | 2.38 | 31.0 | ٥.٣٠ | ١١.٨ | 36.3 | 3.4 | 74.4 | 9.5 | 47.4 | 3140 |
| 26/2011-9 | 2.352 | ٣٢.٤ | ٥.٠٩ | ١٠.٦ | 35.8 | 3.4 | 72.5 | 9.4 | 48 | 3115 |
| 29/2011-1 | 2.396 | ٣٢.٨ | ٤.٧٣ | ٩.٧ | 36.3 | 3.0 | 75.5 | 9.7 | 47.9 | 3140 |
| 29/2011-2 | 2.188 | ٣٣.٨ | ٤.٤٧ | ٨.٧٥ | 35.9 | 3.1 | 74.8 | 9.3 | 48.5 | 3140 |
| 29/2011-5 | 2.192 | ٣٢.٧ | ٥.٠١ | ١٠.٣ | 35.9 | 3.3 | 76.3 | 9.8 | 46.9 | 3110 |
| 29/2011-7 | 2.16 | ٣٣.٠ | ٥.٢١ | ١٠.٦ | 35.0 | 3.2 | 75.7 | 9.3 | 46.4 | 3105 |
| 29/2011-8 | 2.624 | ٣١.٣ | ٤.٩٣ | ١٠.٨٥ | 36.7 | 3.2 | 75.5 | 9.5 | 48.7 | 3170 |
| 30/2011-1 | 2.624 | ٣١.١ | ٤.٩٧ | ١١.٠ | 36.6 | 3.2 | 75.6 | 10.2 | 47 | 3180 |
| 30/2011-2 | 2.544 | ٣٣.٣ | ٤.٩٠ | ٩.٨٠ | 36.8 | 3.1 | 75.9 | 9.9 | 48.4 | 3190 |
| 30/2011-4 | 2.256 | ٣٣.٨ | ٥.٢٦ | ١٠.٣ | 36.5 | 3.3 | 77.7 | 9.9 | 47.3 | 3210 |
| 36/2011-3 | 2.228 | ٣٢.٩ | ٥.١١ | ١٠.٤ | 35.5 | 3.3 | 75.7 | 9.6 | 49.2 | 3120 |
| 36/2011-5 | 2.396 | ٣٤.٢ | ٤.٩٤ | ٩.٥٠ | 36.6 | 3.2 | 75.7 | 9.8 | 49.7 | 3210 |
| 37/2011-1 | 2.096 | ٣٣.٧ | ٥.٥٤ | ١٠.٩ | 36.0 | 3.0 | 75.6 | 9.7 | 44.9 | 3060 |
| 37/2011-2 | 2.21 | ٣٢.٧ | ٤.٨٣ | ٩.٩٥ | 36.5 | 3.2 | 75.7 | 9.8 | 47.4 | 3220 |
| 37/2011-3 | 2.456 | ٣٣.٥ | ٥.٥٧ | ١١.٠٥ | 36.3 | 3.2 | 75.1 | 10.0 | 48.7 | 3245 |
| 37/2011-7 | 2.336 | ٣٣.٣ | ٥.٢٥ | ١٠.٥ | 36.4 | 3.2 | 72.2 | 9.7 | 49.4 | 3225 |
| X families | 2.54 | 32.21 | 4.91 | 10.32 | 36.07 | 3.20 | 75.33 | 9.69 | 47.59 | 3160.9 |
| Xcomparisons | 2.57 | 33.9 | 5.1 | 9.95 | 36.1 | 3.25 | 75.3 | 9.95 | 47.6 | 3165 |
| S. E. | 0.05 | 0.21 | 0.06 | 0.09 | 0.07 | 0.02 | 0.19 | 0.04 | 0.20 | 9.39 |
| CV | 12.30 | 4.20 | 7.85 | 5.79 | 1.35 | 3.05 | 1.63 | 2.61 | 2.79 | 1.93 |

Regarding the results of the ٤ selected families Table 3 were not significant compared with the control in yield and other agronomic characters, fiber and spinning properties as well as seed quality. Pure seeds of the ٣ selected families as the last step in such maintaining program, were massed together to form the breeders seed stock of *G*iza *45* variety in 2103 season, the breeder's seed was named (Giza 45 nucleolus /2014).Table 3 presented the characters of the selected families which form the breeder's seed stock of *G*iza *45* variety in 2104 season and was grown in 2014 season in 8 feddan at Sakha Agricultural Research Station.

These results provide good evidence that the pure seed stock released by the cotton breeder would be maintained pure as the stocks and exclusively remained under the hand of the breeder. Being then the breeder's seed (nucleolus) is further increased to produce the foundation seed as a new cultivar strain carrying the number of the year of its propagation.

lint percentage were opposite as the pure nuclei were higher in lint percentage than the strains for all varieties except for Giza 70 (31.9) and Giza 70/93 (32.5), as reported by Abd El Salam (2000).The results are in greement with those obtained by Abdel-Bary and Bisher (1969), Abdel-Al (1976), El-kilany and Youssef (1985), Younis *et al.* (1993), Abo-Arab *et al.* (1995), Lasheen (1997), El-Disoqui (2001), Nagib and Hemida (2001) ,Abdel-Zaher (2004) and Mohamed (2013).

Cotton Varietal Maintenance Research Department, Cotton Research Institute (C.R.I.) can produce of nucleolus by pedigree selection method is breeding method annual and the breeder use of this method in the production and assets of high genetic purity seeds and matching the specification and important characteristics of the variety. The selection of the proportions of each cycle, depending on the results of the descendants of plants in each generation without any genetic differences because of independent culling selection, thus producing seeds with a high degree of genetic purity and symmetry and homogeneity and to get rid of the influence of circumstances an environmental and note any differences may appear that equity, because of Egyptian varieties raised in order to live as long as possible.

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# خطة التربية والمحافظة وإنتاج النوية (بذرة المربى) لصنف القطن المصري جيزة ٤٥ خلال المواسم ٢٠١١ - ٢٠١٤

**محمد عزت عبد السلام احمد**
**معهد بحوث القطن - مركز البحوث الزراعية – الجيزة - مصر**

يوضح هذا البحث كيفية إنتاج بذرة المربى وكيفية المحافظة على الصنف جيزة ٤٥ وهو من طبقة الأقطان فائقة الطول . أُجرى هذا البحث في محطة البحوث الزراعية بسخا خلال الفترة من ٢٠١١ - ٢٠١٤ م حيث تم انتخاب٤٢ نبات من طراز الصنف جيزة ٤٥ من موسم ٢٠١١ ثم زرعت عام٢٠١٢ مكونة إكثارات ( أ ). ثم أُنتخب منها ١٤ عائلة في نهاية الموسم مكونة اكثارات (ب) وتم تقيمها في تجربة المحصول مع مقارنتين في تجربة قطاعات كاملة العشوائية من أربع مكررات عام ٢٠١٣.

في نهاية الموسم وبناءً على الاختبارات التي أجريت تم انتخاب ٤ عائلات نموذجية تمثل الصنف جيزة ٤٥ في صفاتها المحصولية والتكنولوجية ثم مُزجت بذرتها الذاتية بعناية لتكوين النوية الجديدة (بذرة المربى) والتي زرعت في موسم ٢٠١٤ في مساحة ٨ أفدنة في مزرعة ثاني روينه بمحافظة كفر الشيخ. وتدل النتائ ج المتحصل عليها على كفاءة الطريقة المستخدمة في المحافظة على النقاوة الوراثية للصنف جيزة ٤٥.

ورغم أن طريقة إنتاج النوية بطريقة انتخاب النسب من طرق التربية إلا أنها متبعة فى برنامج و تكنيك قسم بحوث المحافظة بمعهد بحوث القطن و أن المربى يستخدمها للحصول على تقاوي المربى بدرجة نقاوة وراثية عالية و مطابقة لمواصفات و صفات الصنف الرئيسية الهامة . وبذلك يمكن إنتاج تقاوي بدرجة عالية من النقاوة الوراثية و التماثل و التجانس التام و التخلص من التأثير الضار من الظروف البيئية و ملاحظة أي اختلافات و استبعادها وذلك لأن الأصناف المصرية تُربى لكي تعيش أطول فترة ممكنة. وكذلك تشير النتائج إلى أن السلالة الناتجة بهذه الطريقة تمثل المصدر الجيد للبذرة النقية وراثيا والمنتخبة بواسطة المربى والتي يمكن بواسطتها المحافظة على النقاوة الوراثية للصنف جيزة ، خلال مراحل إنتاج التقاوي الأربعة (مربى ، أساس،مسجلة ،معتمدة).

**Table 2. Means of yield, yield components and fiber properties for the 14 selected progenies (increase B) in 2013 season.**

| No. | Selected Families | S.C.Y. K./F. | L.C.Y. K./F. | B.W. gm. | L.P. % | S.I. gm. | Fib. Len. 2.5% m.m | Elon. | L.I. gm. | U.R.% | ST. g./tex | MIC | Yarn stern. | RD % | +b |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 1/2011-6 | 6.2 | 6.8 | ٢.٥٩ | ٣٥.١ | ١٠.٨ | ٣٦.٩ | ٦.٧ | ٥.٨ | ٨٨.٢ | ٤٧.٣ | 2.9 | ٢٦١٠ | 72.8 | 9.0 |
| 2 | 2/2011-3 | 6.5 | 6.9 | ٢.٦٠ | ٣٤.٠ | ١٠.٣ | ٣٧.٨ | ٦.١ | ٥.٣ | ٨٩.١ | ٥٠.٨ | 2.9 | ٢٥٥٠ | 74.4 | 9.5 |
| 3 | 3/2011-1 | 6.7 | 7.0 | ٢.٥٠ | ٣٣.٧ | ١٠.٣ | ٣٧.٩ | ٦.١ | ٥.٢ | ٨٨.١ | ٥٠.٨ | 3.1 | ٢٥٥٥ | 73.8 | 9.5 |
| 4 | 8/2011-2 | 7.7 | 8.4 | ٢.٤٥ | ٣٥ | ١٠.٦ | ٣٧.٧ | ٦.٠ | ٥.٧ | ٨٧.٠ | ٤٧.٨ | 3.2 | ٢٦٤٠ | 72.9 | 9.1 |
| 5 | 8/2011-6 | 7.3 | 7.8 | ٢.٤٥ | ٣٤.١ | ١٠.٦ | ٣٦.٣ | ٦.٨ | ٥.٥ | ٨٨.٤ | ٤٨.١ | 2.9 | ٢٦٤٠ | 74.1 | 9.6 |
| 6 | 17/2011-4 | 6.6 | 7.0 | ٢.٥ | ٣٣.٤ | ١٠.٦ | ٣٦.٩ | ٦.٥ | ٥.٣ | ٨٧.٤ | ٤٩ | 3.2 | ٢٦١٠ | 71.7 | 9.9 |
| 7 | 25/2011-3 | 7.0 | 7.7 | ٢.٦٥ | ٣٤.٩ | ١٠.٢ | ٣٦.١ | ٦.٨ | ٥.٤ | ٨٧.٩ | ٤٣.٧ | 3.2 | ٢٥٣٠ | 74.3 | 10.0 |
| 8 | 26/2011-9 | 6.5 | 7.0 | ٢.٤٣ | ٣٤.٢ | ١٠.٢ | ٣٦.٩ | ٦.١ | ٥.٣ | ٨٩ | ٤٩.٦ | 3.0 | ٢٥٥٠ | 73.3 | 9.5 |
| 9 | 29/2011-1 | 6.6 | 7.1 | ٢.٣٥ | ٣٤.١ | ١٠.٣ | ٣٥.٥ | ٧.١ | ٥.٣ | ٨٧.٠ | ٤٥.٨ | 3.2 | ٢٦٣٠ | 73.5 | 9.0 |
| 10 | 29/2011-2 | 5.2 | 5.6 | ٢.٥٠ | ٣٤.١ | ١٠.٢ | ٣٥.٨ | ٧.٠ | ٥.٢ | ٨٩.٥ | ٤٧.٤ | 3.1 | ٢٥٩٠ | 72.5 | 9.1 |
| 11 | 29/2011-8 | 6.6 | 6.8 | ٢.٤٧ | ٣٣.١ | ١٠.٣ | ٣٦.٥ | ٦.٨ | ٥.١ | ٨٧.٧ | ٤٧.١ | 3.1 | ٢٧٦٠ | 73.6 | 9.5 |
| 12 | 36/2011-5 | 6.9 | 7.6 | ٢.٤ | ٣٤.٧ | ١٠.٣ | ٣٦.١ | ٧.٧ | ٥.٥ | ٨٨.١ | ٤٦.٢ | 3.2 | ٢٦١٠ | 79.4 | 9.2 |
| 13 | 37/2011-2 | 6.9 | 7.3 | ٢.٥٠ | ٣٤.٠ | ١٠.٢ | ٣٧.٠ | ٧.٥ | ٥.٢ | ٨٨.٣ | ٥٠.٥ | 3.1 | ٢٦٩٥ | 71.6 | 9.0 |
| 14 | 37/2011-7 | 6.5 | 7.0 | 2.55 | 34.0 | 10.2 | 35.4 | 7.5 | 5.3 | 87.5 | 45.1 | 3.1 | 2700 | 73.8 | 9.4 |
| C.V. % | | 8.49 | 8.95 | 3.26 | 1.71 | 1.92 | 2.23 | 8.31 | 3.70 | 0.86 | 4.55 | 3.78 | 2.50 | 2.53 | 3.48 |
| Mean of comparisons | | 6.72 | 7.11 | 2.55 | 34.2 | 10.4 | 35.6 | 7.31 | 5.42 | 88.1 | 50.1 | 3.15 | 2585 | 73.3 | 9.25 |
| L.S.D. | 0.05 | 1.27 | 1.66 | NS | 0.92 | NS | | | 0.085 | -- | -- | -- | -- | | |
| | 0.01 | 1.69 | 2.21 | | 1.23 | | | | 0.113 | | | | | | |

**Table 3. Mean of studied characters for 4 families selected from increase B families in 2013 growing season which are commingled to form new nucleolus (breeder's seed) of *G.* 45 in 2013 season.**

| No. | Selected Families | S.C.Y. K./F. | L.C.Y. K./F. | B.W. gm. | L.P. % | S.I. gm. | L.I. gm. | Fib. Len. 2.5% m.m. | U.R.% | ST. g./tex | Mic. | Elon. | + b | RD % | Yarn stern. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | ٢ / ٢٠١٠ - ٣ | 6.50 | 6.9 | ٢.٦٠ | ٣٤.٠ | ١٠.٣ | ٥.٣0 | ٣٧.٨ | ٨٩.١ | ٥٠.٨ | ٢.٩ | ٦.١ | 9.5 | 74.4 | ٢٥٥٠ |
| 2 | ٣ / ٢٠١٠ - ١ | 6.70 | 7.0 | ٢.٥٠ | ٣٣.٧ | ١٠.٣ | ٥.٢٠ | ٣٧.٩ | ٨٨.١ | ٥٠.٨ | ٣.١ | 6.1 | 9.5 | 73.8 | ٢٥٥٥ |
| 3 | ٢٦ / ٢٠١٠ - ٩ | 6.50 | 7.0 | ٢.٤٣ | ٣٤.٢ | ١٠.٢ | ٥.٣0 | ٣٦.٩ | ٨٩.٠ | ٤٩.٦ | ٣.٠ | 6.1 | 9.5 | 73.3 | ٢٥٥٠ |
| 4 | 37/2011-2 | 6.90 | 7.3 | ٢.٥٠ | ٣٤.٠ | ١٠.٢ | ٥.٢0 | ٣٧.٠ | ٨٨.٣ | ٥٠.٥ | ٣.٢ | 7.5 | 9.0 | 71.6 | ٢٦٩٥ |
| Mean of Progenies | | 6.65 | 7.05 | 2.50 | ٣٤.١ | 10.25 | 5.25 | 37.4 | 88.62 | 50.42 | 3.05 | 6.45 | 9.4 | 73.3 | 2587.5 |
| L.S.D. | 0.05 | 1.27 | 1.66 | NS | 0.92 | NS | 0.085 | | -- | -- | -- | -- | -- | -- | -- |
| | 0.01 | 1.69 | 2.21 | | 1.23 | | 0.113 | | | | | | | | |