Current Trends in Natural Sciences Vol. 8, Issue 15, pp. 95-100, 2019

Current Trends in Natural Sciences (on-line)
ISSN: 2284-953X
ISSN-L: 2284-9521

Current Trends in Natural Sciences (CD-Rom)
ISSN: 2284-9521
ISSN-L: 2284-9521

SRAP MARKER BASED COMPARIATION WITH YAMULA EGGPLANT GENOTYPES AND SOME OTHER EGGPLANT VARIETIES

Emrah Uysal [1], Hasan Pinar [1], Aydın Uzun [1,*]

[1] Erciyes University, Dept. of Horticulture, Kayseri, Turkey

Abstract
Turkey have rich local vegetable varieties such as Urfa pepper, Manisa eggplant and Kırkagac melon. One of local vegetable varieties is Yamula eggplant cultivar which grown central Anatolia that forefront with specific striped structure and hard fruit flesh, especially it was consumed by have lived people at its growing regions as fresh, dried and pickled. Uniform fruit, disease resistance and high yielded genotypes are the most important factor for marketable products. But, it is inevitable genetic differences because of producing with obtained seeds yourself. In this study, 28 Yamula eggplant genotypes were compared with 1 Manisa eggplant and 3 Kemer eggplant genotypes using SRAP molecular markers to understand genetic differences/similarity. As obtained results, genetic similarity was 0,68-0,99 and with two cluster. The genetically closest genotypes were ERU 3014-ERU 949 which were Yamula eggplant genotypes. Results showed that there are differences between Yamula eggplant genotypes and other eggplant genotypes, also within Yamula eggplant genotypes.

Keywords: Eggplant, Molecular markers, SRAP.

1. INTRODUCTION

Eggplants, (*Solanum melongena* L.) belongs to the family of the Solanaceae and has a significant place in terms of production area and quantity. The eggplant is cultured in Asia for a thousand years and is called the king of vegetables in India (Daunay and Janick 2007). Eggplant is as valuable as other vegetables in terms of vitamin and mineral content and is a powerful antioxidant. For this reason it is a vegetable with great economic value.

The origin of the eggplant is Asia and Africa. The most known species is *S. melongena* and nowadays it is cultivated all over the world. Eggplant spread to Anatolia towards the end of the 16th century or into the beginning of the 17 th century and is a vegetable that is evaluated freshly, processed by processing or drying and has a special place in Turkish cuisine. According to the FAO data in 2016, the world total eggplant production is about 51 million tons from 1.9 million hectares. The most cultivated country in the world is eggplant, China, which has about 32 million tons of production. Followed by India with 12.5 million tons and Egypt is the third with 1.2 million tons of production. Turkey is in the fourth place with approximately 854 thousand tons of production (FAOSTAT, 2016).

In recent years, There is rapid transition to the F1 hybrid varieties from standard varieties at vegetalble production such as eggplant in Turkey. However, although there is an increase in yield when production is made with F1 hybrid varieties other than local varieties, but the desired quality

*Corresponding author, E-mail address: uzun38s@yahoo.com

Current Trends in Natural Sciences (on-line)
ISSN: 2284-953X
ISSN-L: 2284-9521

Current Trends in Natural Sciences (CD-Rom)
ISSN: 2284-9521
ISSN-L: 2284-9521

can not be achieved. The speed of local seeds in Turkey accelerated the use of local varieties for both standard seed and F1 hybrid seed. Local genetic resources have to be collected and characterized first. Then, as a standard variety, it needs to be improved in order to eliminate some negative features. One of the most important of these genetic resources is the standard eggplant variety called Yamula eggplant which is cultivated in Kayseri province and its vicinity. Total production area in Central Anatolia Region (Kırıkkale, Aksaray, Niğde, Nevşehir, Kırşehir, Kayseri, Sivas, Yozgat) and production quantity is about 8.884 tons (TUIK, 2016). In particular, eggplant production of Kayseri constitutes the Yamula eggplant. The Yamula eggplant is characterized by its unique striped structure, hard fruit flesh, and is consumed by people in the area where it is grown, in different forms as dried food, fresh consumption and brine. However, while productivity is increasingly decreasing as producers make their own seeds by obtaining them, susceptibility to diseases has begun to restrict production by the introduction of new diseases and pests in production regions. At the same time, uneven fruit sizes and colors are common in markets When productivity and quality are not improved in this kind of production, it will become impossible to produce in the production regions. The way to prevent this species it needs increase the resistance to diseases and productivetiy.

Genetic relationships between ten genotypes of eggplant (*Solanum melongena* L.) were studied using ISSR molecular markers. Seven out of 20 ISSR primers were used to assay the levels of polymorphism among the Egyptian cultivars of eggplant (*Solanum melongena* L) In the present work, some variations in banding patterns were observed among these ten genotypes where twenty four monomorphic and 47 polymorphic distinct fragments (61% of polymorphism) which appeared a high level of polymorphism between them(Mahmoud and El-Mansy, 2012). Also, Boyacı et al. (2015) carriee out using a total of 38 eggplant genotypes, of which 32 were heirloom accessions collected from different regions of Burdur province five were different local genotypes from other provinces, and one was a cultivar, were used as reference. The phylogenetic relationships among these heirlooms were evaluated using 40 morphologic descriptors and five RAPD markers. They reported that Burdur heirloom accessions showed high genetic diversity based on morphological and molecular data with the genetic similarity rates ranged from 0.29 to 0.91 according to the morphological data, and ranged from 0.84 to 0.98 according to the molecular data.

In this study, it was aimed to determine the genetic similarities/differences of 28 Yamula invasive genotypes selected by considering the plant and fruit characteristics from the production areas of Kayseri province Yamula eggplant by SRAP molecular marker method.

2. MATERIALS AND METHODS

A total of 28 Yamula eggplants genotypes were selected from the Kayseri province as plant and fruit characteristics. In addition, 1 Manisa eggplant genotype and 3 Kemer eggplant genotypes were studied (Table 1). Seeds from each genotype were germinated in 3: 1 peat: perlite medium.

2.1 DNA Isolation

Fresh leaf samples from each genotype were lyophilized for DNA extraction. Total genomic DNA was obtained according to the protocol of Doyle and Doyle (1990). DNA quality was determined via agarose gel electrophoresis.

*Corresponding author, E-mail address: uzun38s@yahoo.com

Current Trends in Natural Sciences (on-line)
ISSN: 2284-953X
ISSN-L: 2284-9521

Current Trends in Natural Sciences (CD-Rom)
ISSN: 2284-9521
ISSN-L: 2284-9521

Table 1. Genotypes used in the study

No	Genotype	Explanation
1	ERU-3004	Yamula Eggplant
2	ERU-3005	Yamula Eggplant
3	ERU-3006	Yamula Eggplant
4	ERU-3007	Yamula Eggplant
5	ERU-3008	Yamula Eggplant
6	ERU-3009	Yamula Eggplant
7	ERU-3010	Yamula Eggplant
8	ERU-3011	Yamula Eggplant
9	ERU-3012	Yamula Eggplant
10	ERU-3013	Yamula Eggplant
11	ERU-3014	Yamula Eggplant
12	ERU-3015	Yamula Eggplant
13	ERU-3016	Yamula Eggplant
14	ERU-3017	Yamula Eggplant
15	ERU-3018	Yamula Eggplant
16	ERU-949	Yamula Eggplant
17	ERU-950	Kemer Eggplant
18	ERU-951	Yamula Eggplant
19	ERU-952	Yamula Eggplant
20	ERU-953	Yamula Eggplant
21	ERU-954	Yamula Eggplant
22	ERU-955	Yamula Eggplant
23	ERU-956	Yamula Eggplant
24	ERU-957	Yamula Eggplant
25	ERU-961	Yamula Eggplant
26	ERU-964	Manisa Eggplant
27	ERU-1255	Kemer Eggplant
28	ERU-1256	Kemer Eggplant
29	ERU-3000	Yamula Eggplant
30	ERU-3001	Yamula Eggplant
31	ERU-3002	Yamula Eggplant
32	ERU-3003	Yamula Eggplant

2.2 PCR

In the study, 10 SRAP primer combinations which were successful in the pre-test were used. The volume for the PCR reaction was 15 µl. The PCR reaction in each sample was prepared as follows: 2.5 mM MgCl2, 0.1 mM dNTPs, 1 unit Taq DNA polymerase (GibcoBRL, NY, USA) 1x PCR buffer (20 mM Tris-HCl, pH 8.4, 50 mM KCl), 1 M primer and 25 ng genomic DNA. PCR was performed using a thermocycler model PTC 200 (MJ Research, Watertown, Mass., USA). The PCR products were run on agarose gel after adding ethidium bromide and then pictured under UV light. SRAP PCR cycle was 3 min at 95 0 C, 45 min at 94 0 C, 1 min at 35 0 C, 1 min at 72 0 C, 45 min at 94 0 C, 1 min at 50 0 C, 1 minute at 72 ° C and 5 seconds at 72 ° C.

The bands in the images obtained by gel electrophoresis and imaging processes were scored and recorded. The obtained data were analyzed in NTSYS packet program and dendrogram was

*Corresponding author, E-mail address: uzun38s@yahoo.com

Current Trends in Natural Sciences (on-line)
ISSN: 2284-953X
ISSN-L: 2284-9521

Current Trends in Natural Sciences (CD-Rom)
ISSN: 2284-9521
ISSN-L: 2284-9521

obtained according to UPGMA method. Variations and similarity levels between the types of aubergine used in the study and the characteristics of the genetic structure were determined. The total number of bands, number of polymorphic bands and polymorphism rates were determined for each combination of primers.

3. RESULTS AND DISCUSSION

With 32 eggplant genotypes, 10 SRAP primer combinations were used and polymorphism was obtained in all combinations. The total number of bands was 67, the polymorphic band number was 51 and the polymorphism rate was 73.72% (Table 2). According to the obtained UPGMA dendrogram, the similarity between 0,68 and 0,99 was found. The closest genotypes 11 and 16 (ERU 3014-ERU 949) were detected (Figure 1). The two main groups, (8 in the first group and 24 in the other group) has been identified. These two main groups are subdivided into subgroups.

Table 2. Polymorphism table

Primer Name	Primer Band Length (bp)	Total Number of Tape	Number of Polymorphic Bands	Polymorphism Rate (%)
Em2-Me4	120-1000	12	10	83.33
Em2-Me5	200-700	6	4	66.66
Em2-Me11	190-650	7	6	85.71
Em2-Me12	150-900	8	6	75.00
Em6-Me2	160-1200	8	7	87.50
Em6-Me4	180-500	6	4	66.66
Em14-Me4	210-900	5	3	60.00
Em3-Me2	100-500	3	2	66.66
Em8-Me1	150-610	7	6	85.71
Em8-Me2	150-610	5	3	60.00
Total		**67**	**51**	**73,72**

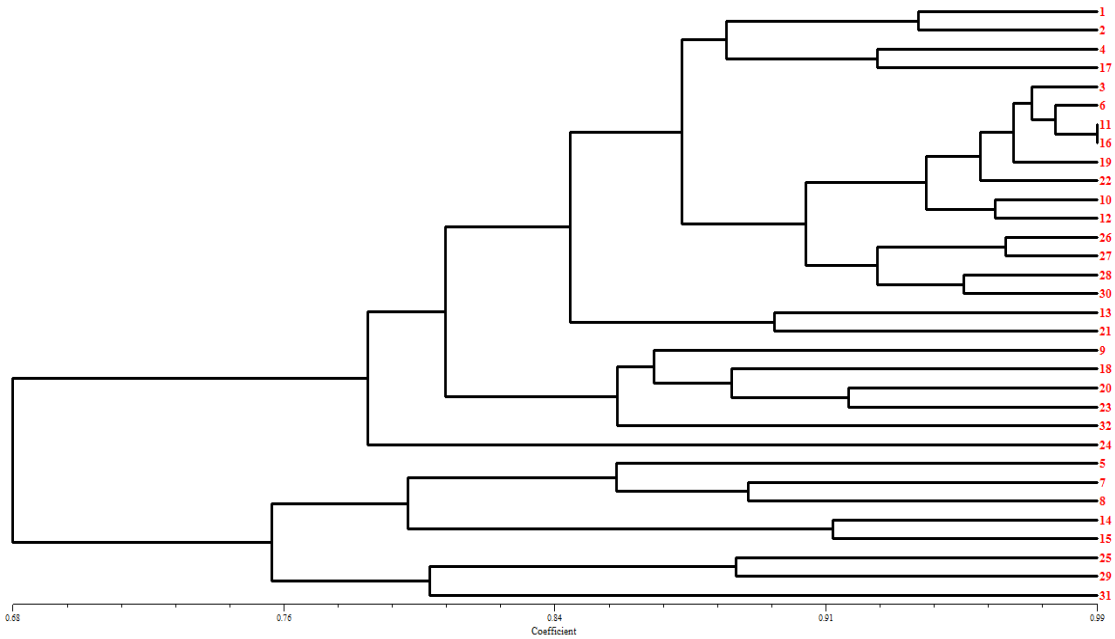

Figure 1. UPGMA dendrogram of SRAP primers

http://www.natsci.upit.ro
*Corresponding author, E-mail address: uzun38s@yahoo.com

Current Trends in Natural Sciences (on-line)
ISSN: 2284-953X
ISSN-L: 2284-9521

Current Trends in Natural Sciences (CD-Rom)
ISSN: 2284-9521
ISSN-L: 2284-9521

Diverse molecular marker techniques have been used to study molecular characterization in the plant. The molecular markers of RAPD (Singh et. al. 2006; Tiwari et.al. 2009), AFLP (prohens et. al. 2005), ISSR (Isshiki et. al. 2008; Ali et.al. 2011), SRAP (Li et.al 2010), SSR (Munoz-Falcon et. al. 2011; Demir et. al. 2010; Stagel et. al. 2008; Behera et. al. 2006; Nunome et. al. 2003) have been previously identified in relation to the identification of genetic differences and similarity between eggplant genotypes used. In the analysis of 56 eggplant genotypes, 55 SRAP primer combinations were used (Munoz-Falcon et. al. 2011). In a study with 143 eggplant genotypes, ISSR markers were found to be more effective than RAPD markers to determine genetic diversity (Isshiki et. al. 2008). The using SSR and RAPD markers are made of the molecular characterization of eggplant genotypes collected from different parts of Turkey. In the study which conducted with 11 RAPD primers, polymorphism was observed in 29 out of 100 bands, and it was determined that the primer producing the most polymorphic band was the OPB07 primer with 64% (Demir et. al. 2010). In a study conducted, 8 eggplant genotypes were compared using ISSR primers. At the end of the study it is stated that ISSR primers can be used for genetic mapping studies in the pathogenesis because they show high polymorphism Similar results were obtained in the study we did.

4. CONCLUSIONS

As a result of the results in the study, a significant genetic similarity/diversity was found between both the Yamula eggplants genotypes and the control groups.

The obtained variation can be used both in the development of the standard Yamula eggplant and in the eggplant breeding programs to be prepared for other purposes. In addition, the SRAP used in this study demonstrates that the molecular marker technique can be successfully used to determine genetic similarity/diversity among varieties and varieties.

5. ACKNOWLEDGEMENT

Present study was supported by Erciyes University, Science and Research Unit (Project Number: FCD-2016-6379)

6. REFERENCES

Ali, Z., Xu, Z.L., Zhang, D.Y., He, X.L., Bahadur, S., Yi, J.X. (2011). Molecular Diversity Analysis of Eggplant (*Solanum melongena*) Genetic Resources, *Genetics and Molecular Research*, 10 (2), 1141-1155.

Behera, T., Sharma, P., Singh, B., Kumar, G., Kumar, R., Mohapatra, T., Singh, N. (2006). Assessment of genetic diversity and species relationships in eggplant (*Solanum melongena* L.) using STMS markers. *Scientia Horticulturae*, 107, 352–357.

Boyacı, H. F., Topcu, V., Tepe, A., Yıldırım, I. K., Oten, M., Aktas A. (2015). Morphological and Molecular Characterization and Relationships of Turkish Local Eggplant Heirlooms *Not Bot Horti Agro*, 43(1), 100-107.

Daunay, M. C., Janick, J., (2007). History and Iconography of Eggplant, Chronica Horticulturae, Vol 47, Number 3, 16-22.

Demir, K., Bakır, M., Sarıkamış, G., Acunalp, S. (2010). Genetic Diversity of Eggplant (*Solanum melongena*) Germplasm from Turkey Assessed by SSR and RAPD Markers, *Genetics and Molecular Research*, 9(3), 1568-1576.

Doyle, J.J., Doyle, J.L. (1990). Isolation of Plant DNA from fresh tissue. *Focus*. 12, 13-15.

FAO, (2016). Statistical Databases [http://www.fao.org/] 2016.

Isshiki, S., Iwata, N., Khan, M.M.R. (2008). ISSR variations in eggplant (*Solanum melongena* L.) and related Solanum species. *Scientia Horticulturae*, 117, 186–190.

Li, H., Chen, H., Zhuang, T., Chen, J. (2010). Analysis of genetic variation in eggplant and related *Solanum* species using sequence-related amplified polymorphism markers, *Scientia Horticulturae*, 125 (1), 19-24.

Mahmoud, M.I. and El-Mansy, Ahmed, (2012). Molecular identification of eggplant cultivars (*Solanum melongena* L.) using ISSR markers. *Journal of Applied Sciences Research* 8(1), 69-77

*Corresponding author, E-mail address: uzun38s@yahoo.com

Current Trends in Natural Sciences (on-line)
ISSN: 2284-953X
ISSN-L: 2284-9521

Current Trends in Natural Sciences (CD-Rom)
ISSN: 2284-9521
ISSN-L: 2284-9521

Munoz-Falcón, J.E., Vilanova, S., Plazas, M., Prohens, J. (2011). Diversity, relationships, and genetic fingerprinting of the Listada de Gandía eggplant landrace usinggenomic SSRs and EST-SSRs. *Scientia Horticulturae* 129, 238–246.

Nunome, T., Suwabe, K., Iketani, H., Hirai, M. (2003). Identification and characterization of microsatellites in eggplant. *Plant Breeding*, 122:256-262.

Prohens, J., Blanca, J.M., Nuez, F. (2005). Morphological and molecular variation in a collection of eggplants from a secondary center of diversity: implications forconservation and breeding. *Journal of the American Society for Horticultural Science*, 130, 54-64.

Singh, A., Singh, M., Singh, R., Kumar, S., Kaloo, G. (2006). Genetic diversity within the genus (*Solanecea*) as revealed by RAPD markers. *Current Science*, 90, 711-716.

Stagel, A., Portis, E., Toppino, L., Rotino, G.L., Lanteri, S. (2008). Gene-based microsatellite devolopment for mapping and phylogeny studies in eggplant. *BMC Genomics*, 357-370.

Tiwari, S.K., Karihaloo, J.L., Nowsheen, H., Gaikwad, A.B. (2009). Molecular Characterization of Brinjal (*Solanum melongena* L.) Cultivars Using RAPD and ISSR Markers, *Journal of PlantBiochemistry and Biotechnology*, 18 (2), 189-195.

TUIK, 2016. Bitkisel Üretim İstatistikleri. http://www.tuik. gov.tr/.

*Corresponding author, E-mail address: uzun38s@yahoo.com