IJAFLS International Journal of Agriculture, Forestry and Life Science, 1(1) 2017, 21-26
ORIGINAL PAPER
e-ISSN: 2602-4381 Received: 12.09.2017 Accepted: 11.10.2017 Published: 25.12.2017

MOLECULAR CHARACTERIZATION OF DIFFERENT CURRANT TYPES

Ayşen Melda ÇOLAK[1*], Fatma ALAN[2]

[1]Usak University, Faculty of Agriculture and Natural Sciences, Department of Horticulture, Uşak, Turkey
[2]Erciyes University, Faculty of Seyrani Agriculture, Department of Horticulture, Kayseri, Turkey

*Correspending author: aysenmelda.colak@usak.edu.tr

Abstract

When berries are of the case, Strawberry, Raspberry, Blackberry, Currants, Gooseberry Blueberries, Elderberry, Wild spindle, Rosehip, Berberis and Sloe generally come to mind and they are fruit types that are consumed deliciously in the world. Their conservation in fresh, following the harvest, their long storage in cold stores and their marketing bear great importance with respect to other fruits. In DNA isolation of berries, more and qualified DNA is obtained by using fresh leaf tissue than old leaf tissue. In this paper, DNAs isolated with the method of CTAB DNA isolation from the leaf of five different currant types (Jostaberry, Redlake, Goliath, Rovada and Boskopgiant) bought Eymen Plantation in Bursa-Kestel province of Turkey are companed with each other in terms of their quantity and quality. Purity and quantity and DNAs which are obtained from young leaves are determined both by gel electrophoresis measurements and UV spectroscopic one. Whether there happens to be genetic variations between the types according to DNA resource is determined by applying ISSR primer and PCR to the DNAs obtained in the study.

Keywords: Currant, Genetic variations, Moleculer marker

INTRODUCTION

There is an increasing interest in the inclusion of berries, especially currant in the human diet mainly for the health benefits associated with their consumption (Okatan et al., 2017). Current (Ribes nigrum), taking its place in Ribes genus of the Saxifragaceae family of Rosales order, consists approximately 150 types which spread heavily over Northern warm climate regions (Eyduran, 2007). Today it is grown for its 10-12 types of fruit among which are mainly black currant (*Ribes nigrum* L.) red and white currant (Ribes sativum L.) (Mitchell, 2011). Ribes type is diploid and its cromosom number is 2n=16. Its blossoms, in its second development year.

Bloom on blossom bunches which has blossoms between 2 and 70 although it varies according to type.

Many currant type are monoic but there are also some types of dioic like R.alpinum. Whereas commercial types of currants have blossom number of 6-12 on each bunch, red currant's blooming is higher its blossoms are generally inferior and pentamerious.

Blossoming of Ribes type starts at late June or early July in Northern hemisphere and ends in late August (Brennan,2008). This period happens to be April or May in Turkey Blossoming period of black currants last for 3 or 4 weeks (İslam, 2010). Its blossoms have a colour of green-like or green-like Brown. Its male organs are shorter than its surrounding epicalyces, which have red spots and bowl shape. Its fruits are circular-like, oblate, with papillary spots on it and small and red. But you can see rose red and white types in culture forms (İslam, 2010). It is getting known for its economically high value and high anthocyanin and vitamin C source which is good for human health. It is also valuable in manufactory jelly and tart (Hayden,1987).

Its leaves which have a length of 5 or 10 cm, with circular, 3-5 sliced, thich saw-like tooth shape, own a strong, not liked fragrance. Its young creepers are yellow-like brownish, short with thin feathers, scarcely tough feathers (İslam, 2010). Currants varieties perform better at 2.0×1.2 m distance, 5 branches with pruning system (Okatan and Aşkın, 2017).

Currant, a thornless fruit, growing upright, can reach up to 2 meters high (İslam, 2010). It is durable and easy to grow. It prefers cool and humid-rich climates but durable and organically-rich soils (Hayden et al., 1987; İslam, 2010).It is indicated that five kinds of currant grow in Turkey which are called as currant with black fruit *(Ribes nigrum L.)*, North Black Sea currant *(Ribes orientalis L.)* Alpine currant *(Ribes alpinum L.)* Caucasus currant (Ribes biebersteinii Berl Ex. Dc) and *Ribes rubrum* used in landscape planning and grown as decoration plant (Eyduran, 2007). Currants are very rich about A, B, B2 and C of vitamins (Okatan et al., 2015).

Molecular markers yield positive results in determining genetic diversity. DNA markers are widely used in genetic deversity studies of berries, in identifying the kind and in building up genetic maps (Uzun, 2009). ISSR (Inter Simple Sequence Repeat) marker system is dominant marker one of the advantage of which is its avaliability for primer design with no need for sequence knowledge. ISSR marker system makes ISSR (Inter Simple Sequence Repeat) analysis applicaple to the studies of genetic similarity, gene mapping and tacsonomy. In this marker

system, as in RAPD marker system, low repeability and similar-sized particles not being homologous are among its disadvantages.

In this study, genetic similarity among five different currant types are identified by using ISSR (Inter Simple Sequence Repeat) markes.

MATERIAL AND METHOD

Five different currant types (Jostaberry, Redlake, Goliath, Rovada and Boskop giant) are used for ISSR analysis. 10 ISSR primer are employed and 10 primer combinations are initially tested in PCR experiments. In those experiments, primer combinations which yield good results are used in PCR studies of all the samples (Rohlf, 2004). Table 1 shows the 10 combinations of primers giving good results.

Table 1. ISSR (Inter Simple Sequence Repeat) Primers

No	Primer Name	Primer extension 5' -3'
1	$(CAC)_3GC$	CACCACCACGC
2	$(CAC)_6$	CACCACCACCACCAC
3	$(AG)_7YC$	AGAGAGAGAGAGAGYC
4	$BDB(CA)_7C$	BDBCACACACACACACAC
5	$HVH(TCC)_7$	HVHTCCTCCTCCTCCTCCTCC
6	$(CA)_6AC$	CACACACACACAAC
7	$(AG)_8$ T	AGAGAGAGAGAGAGAGT
8	$(CA)_8$ R	CACACACACACACACAR
9	$(VHVGTG)_7$	HVVGTGTGTGTGTGTGTG
10	$(DBDACA)_7$	DBDACACACACACACACA

Fresh green leaves of currant types for DNA isolation were picked up in April and sent to Erciyes University Seyrani Agriculture Faculty Research Departmet Laboratory and conserved in Freezer at -80^0C degree. Then, young leaves are pressed inside liquid nitrogen in Tissulyser II (Roller Press) device at the frequency of 22-25 and their DNA isolation is conducted. DNA

isolations are carried out according to CTAB protocol which was modified from Doyle and Doyle (1990).

1 (one) is given for band presence, 0 (null) is given for band absence and 9 (nine) is given for absence of amplification. And then, bands seen on the gel are assessed. The resulting data are analyzed in NTSYS (Numerical Taxonomy Multivariate Analysis System, NTSYS-pc version 2.1, Exeter Software, Setauket, N.Y., USA, Rohlf, 2000) computer packet programs similarity indexes are accounted according to Dice (1945) method and currant types that are similar in terms of genetical characteristics are classified by employed UPGMA grouping analysis method (Unweighted Pair-Group Method With Arithmetic Average).

FINDINGS AND DISCUSSION

According to the assessment conducted by employing Dice (Dice, 1945) method, the similarity rate ranges from 0,48 to 0,67. UPGMA dendogram Figure 1 which indicated genetic diversity among currant genotypes is made by employing Dice similarity matrix (Rohlf, 2004). According to this dendogram, 2 groups are apparently seen above %52 similarity level. While one of the groups consists only Rovada type (Type 5), the rest of the all currant types find their place in the other group. Type resulting findings show that genetic diversity among currant types used in the study is low (Rohlf, 2004).

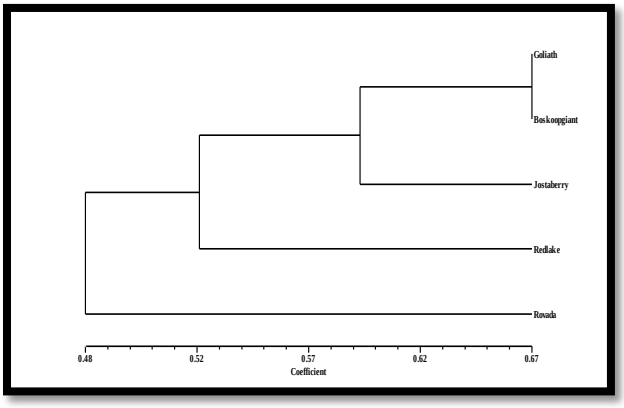

Figure 1. UPGMA (Unweighted Pair-Group Method With Arithmetic Average) dendrogram showing genetic diversity among the genus of blackcurrant.

RESULT

Similarity level of 5 currant genotypes varies between 0,48 and 0,67 and two main groups with genome similarity average of approximately 0,57. One of the groups is comprised of only Rovada (Type 5) genotype while the other group includes the other 4 currant genotypes (Goliath, Boskoop giant, Jostaberry and Redlake).

According to UPGMA (Unweighted Pair-Group Method With Arithmetic Average) dendogram genetic similarity in all genotypes is identified as %48. It is found that in the first group of first main group, there are 4 genotypes (Goliath, Boskoop giant, Jostaberry and Redlake); in the other group, there is only one genotype (Rovada). Currant are grouped into two according to genome similarity. The resulting findings show that a considerable variation exists and genetic difference is low among different 5 currant types representing different regions of Turkey. This low genetic diversity among the kinds studied may pose problems to future rehabilitation works and therefore making it hard to identify convenient types for each region in Turkey. Thus, the fact that types or genotypes with wider genetic diversity should be involved in the study for future adaptation works will facilitate the identification of the types that can be suggested for the regions with different climates and soil conditions.

RESOURCES

Brennan, R. M., 2008. Currants and Gooseberries, Temperate Fruit Crop Breeding, J.F. Hancock (ed.), Chapter 6, 177-196, Scotland, UK.

Eyduran, S. P., Ağaoğlu, Y. S., 2007., Some Pomological and Vegetative Characteristics of the Currants Cultivated in Ankara (Ayas) Conditions Ankara University Faculty of Agriculture, Journal of Agricultural Sciences 13 (3) 293-298.

Hayden, R. A., Dana, M. N., Lerner, B. R., 1987. Currants and Gooseberries. HOPurdue University, Cooperative Extension Service, no.17, p.2.

İslam, A., 2010. Grape Fruit Growing Undergraduate Course Note (Unpublished), Ordu University Faculty of Agriculture Department of Horticulture, .42 s.

Mitchell, C., Brennan, R. M., Cross, J. V., Johnson, S. N., 2011. Arthropod Pests Of Currant and Gooseberry Crops in The U.K. : Their Biology, Management and Future Prospects. Agricultural and Forest Entomology, 13, 221–237.

Okatan, V., Polat, M., Aşkın, M. A., & Çolak, A. M. (2015). Frenküzümü (*Ribes* spp.), Jostaberry (Ribes x nidigrolaria Bauer) ve Bektaşi Üzümünün (*Ribes grossularia* L.) Fiziksel Özelliklerinin Belirlenmesi. Süleyman Demirel Üniversitesi Ziraat Fakültesi Dergisi 10 (1): 83-89.

Okatan, V., GÜNDOĞDU, M., GÜÇLÜ, S. F., ÇELİKAY, A., ÖZAYDIN, A. M. Ç., KORKMAZ, N., ... & AŞKIN, M. A (2017). Phenolic Profiles of Currant (Ribes spp.) Cultivars. YYÜ TAR BİL DERG (YYU J AGR SCI), 27(2): 192-196

Okatan, V., & AŞKIN, M. A. (2017). THE EFFECTS OF DIFFERENT GROWING SYSTEMS ON THE YIELD AND QUALITY OF CURRANT CULTIVATION. Scientific Papers. Series B, Horticulture. Vol. LXI, 21-26.

Rohlf., 2004. Numerical Taxonomy Multivariate Analysis System, NTSYS-pc version 2.11, Exeter Software, Setauket, N.Y. USA.

Uzun, A., 2009. Characterization of Genetic Diversity in Citrus with SRAP Markers, Doctoral Thesis, Cukurova University, Institute of Science and Technology, Adana.