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STANDARD CHARACTERIZATION OF RED ONION LANDRACES 'DE BUZĂU' AND 'DE TURDA'

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Abstract

To maintain food security, the conservation and sustainable use of all plant genetic resources for food and agriculture (PGRFA) is essential under the International Treaty on Plant Genetic Resources for Food and Agriculture (Plant Treaty) adopted in 2005 based on the Convention on biological diversity signed in 1992. Both Conventions have been ratified by Romania and the conservation and sustainable use of domesticated crops and edible wild plant species needs to be addressed in near future. The scope of this article is to analyse two onion landraces for evaluating their status of conservation and furthermore, to propose some measures for their further conservation and sustainable use based on the needs of local communities. We underline that onion is mentioned on the Annex of the Plant Treaty as a PEGFRA. Red onion landraces 'de Turda' was officially recognized in 1952 and 'de Buzău' in 1977, based on the analysis of Official Catalogues. If, the landrace 'de Turda' was erased from the Official Catalogue after 1990, 'de Buzău' continues to be recognized at the official level. Both landraces have been assessed against the UPOV Standard TG/46/7, to find solutions for further recognition of 'de Turda' onion as an important plant genetic resources for food based on the provisions of Directives 2008/62 / EC, 2009/145 / EC and 2010/60 / EU. The analysis of our results reveals that 'de Buzău' is producing large size bulbs and 'de Turda' is producing medium size bulbs and both are distinct, uniform and stable based on Standard TG/46/7 requirements. The consistent results of our analysis further support the need for on farm conservation of these two genetic resources in their agro-ecosystems of origin that is important for food security maintenance in local communities.

Key words**:** *autochthone landrace, onion, 'de Buzău', 'de Turda', UPOV standard TG/46/7.*

INTRODUCTION

To maintain food security, the conservation and sustainable use of all plant genetic resources for food and agriculture is essential under the International Treaty on Plant Genetic Resources for Food and Agriculture (ITPGRFA) that it was adopted based on the Convention on biological diversity [7]. Both Conventions have been ratified by Romania and the conservation of biological diversity is on edge due to climate change effects for domesticated crops and edible wild plant species and the lack of any strategy for supporting their conservation and sustainable use [2].

Onion (*Allium cepa* L.) is a crop of major importance in Romania and its cultivation is closely related to the history of the country [18]. This crop species is listed into the Annex of the International Treaty on Plant Genetic Resources for Food and Agriculture, or Plant Treaty, further supporting the relevance of this species all over the world for biodiversity conservation and food security. Today, many scientific articles claim that we assist to tremendous genetic erosions in crops generally [6, 12, 15]. The constraints imposed by globalization of the trade and lack of consistent policies at the regional level in supporting the landrace for *on farm* conservation are among the major threats [8, 11]. Complex strategies for reinforcing the conservation of all plant genetic resources for food and agriculture (PGRFA) have also been published [4, 5, 16, 17]. The working group of experts on *Allium* at the European level is interested in long time in ensuring the conservation of all potential genetic resources that may support food security for long term [14]. The scope of this article is to reveal that in Romania still exist valuable onion genetic resources that need to be officially recognized for their value in supporting food security. In this regards red

onion bulbs belonging to two autochthonous landraces 'de Buzău', from South Romania and 'de Turda' from Transylvania, provided by local producers, will be described based on the UPOV Standard TG/46/7 (UPOV, 2008). Both landraces will be assessed against the evaluation of their status of conservation in the place of origin [1].

MATERIALS AND METHODS

Study area was represented by Mărăcineni Commune, Buzău county (Lat. 45°12′ and Long. 26°48′E) and Viișoara Commune, Cluj county (Lat. 46°33′28″ Long. 24°56′00″), where two producers and landowners from each of the localities have provided onion bulbs of red onion landraces 'de Buzău' and 'de Turda'. They are producers of red onion for more than 50 years and onion seeds are originating from their own production.

Plant material. Mature onion bulbs for trade as commodity have been examined after their harvesting from three original locations during October, 2015 (i.e. 100 onion bulbs of each location have been purchased directly from producers).

Morphomteric measurements. A lab ruler and a professional calliper have been used for the evaluation of morphometric characteristics according to the UPOV Standard TG/46/7 [20]. A Canon camera was used at a fixed point of 30 cm under a light intensity between 2,500 and 8,000 Lx. Measurements and observations were realized for longitudinal, top-down and bottom-up views of the onion bulbs. An analytical balance Bio-Rad and an oven Froilabo AP60 were used for fresh weight and dry matter analysis.

Surveys. National official catalogues for plant varieties and hybrids and hybrids, starting with 1952, were surveyed for the evaluation of the official status of conservation of these landraces and particularly regarding the situation of official recognition of onion landraces in Romania. *Ex situ* conservation programmes survey is run by the Gene Bank from Suceava as the National Focal Point under the Plant Treaty, and secondary may be supported by Research Stations from Buzău, Mărăcineni and Turda. They were surveyed for the presence of these landraces in their databases. The portal of National Institute for Statistics was surveyed for onion cultivation and production.

Evaluation of status of conservation was realized based on the existing methodology and published in 2011 [1].

RESULTS AND DISCUSSIONS

Landrace's definition is not yet generally accepted by the scientific community. However, at the international level stands the definition first provided by Anderson and Cutler in 1942 that was supported by recent researchers [19]. One relevant definition, with a broad acceptance is that provided by Zeven in 1998 [21]. He proposed two terms: autochthonous landraces (cultivated for long time in the ecosystem of origin) and allochthonous landrace (landraces recognized to be introduced in a certain ecosystem). The major threat for our autochthonous landraces, that are recognized to achieve a relevant recognition for their qualities, is that they are endangered to disappear or to become allochthonous in the country of origin but in different agro-ecosystems, due to inconsistent political strategies for *in situ* or *on farm* crops conservation. The results of this article are based on original autochthonous landraces provided by local producers belonging to original agro-ecosystems with a long history of cultivating these plant genetic resources (i.e. over 100 years).

Onion bulbs characterization of autochthonous landraces: 'de Buzău' and 'de Turda'.

Degree of splitting into bulblets (Standard characteristic no. 11). Both landraces 'de Buzău' and 'de Turda' generally present into their bulbs at least two bulblets and occasionally three. The degree of splitting into bulblets was 18.53% for 'de Buzău' and 22.56% for 'de Turda'. Such a characteristic may be enhanced by climatic conditions based on producers, but never reached 30% in the case of both producers even there is the situation of two completely different landraces.

Bulb size was evaluated after the dry skin, roots and stems have been removed. The average

fresh weight for 'de Buzău' was 172.35 g (i.e. the fresh weight ranged between 150 and 200 g) and for 'de Turda' it was 68.23 g (i.e. the fresh weight ranged between 38.23 and 100.35 g) (Fig. 1 a). Based on these results and according with the Standard characteristic no. 12.1., 'de Buzău' is a large size onion and 'de Turda' is a medium size onion.

Bulb height for 'de Buzău' is 12.02 cm ranging between 9.23 and 15.22 cm and for 'de Turda' is 6.58 cm ranging between 4.23 and 8.98 cm. In case of 'de Buzău' 85% of the bulbs ranged between 12 and 14 cm being a large class onion. However, over 72% of 'de Turda' bulbs are ranging between 6 and 7 cm, and according with the Standard characteristic no 13.1. it is a medium class onion (Fig. 1 b).

Bulb diameter ranged for 'de Buzău' between 4.21 and 6.30 cm (i.e. average bulb diameter: 5.03 cm) and for 'de Turda' it ranged between 3.80 and 5.87 cm (i.e. average bulb diameter: 4.85 cm). Around 78,3% of the bulbs 'de Buzău' ranged ±0,5 cm around 6 cm and for 'de Turda' 82% the bulbs ranged ±0,5 cm around 6.5 cm. According with the Standard characteristic no. 14.1., both landraces are medium size onion bulb (Fig. 1 c).

Bulb ratio height/maximum diameter ranges between 4 and 6 (cm/cm) for 'de Buzău' (i.e. an average ratio of 5.03) and between 1.08 and 2.53 with for 'de Turda' (i.e. an average ratio of 4.85) (Fig. 1 d). Both local varieties may be classified as medium size onion according the Standard characteristic no. 15.1.

Bulb position of maximum diameter was at the half height of the bulb for 'de Buzău'. However, for 'de Turda', at least two population have been described such as: 76% of the bulbs with the maximum diameter position at *the middle*, but 24% of the bulbs were at *towards the stem end* (1.53 cm) (Figs. 2 a, 2b). As most of the bulbs the maximum diameter position is at the half of the height both landraces may be considered as positioned in *the middle* according with the Standard characteristic no. 16.

Bulb shape of stem end in case of 'de Buzău' proved to be *strongly sloping* in all samples. However, for 'de Turda' about 24% of the bulbs were rounded and 76% *slightly sloping*. Based on the Standard characteristic no. 19, it can be considered that the onion population is dominated by the *slightly sloping* bulb shape of stem end (Fig. 1).

Bulb shape of root end proved to be only *round* shape for both landraces based on the Standard characteristic no. 20. The root diameter for 'de Buzău' has an average of 1.31 cm and for 'de Turda' of 1.02 cm (Fig. 1).

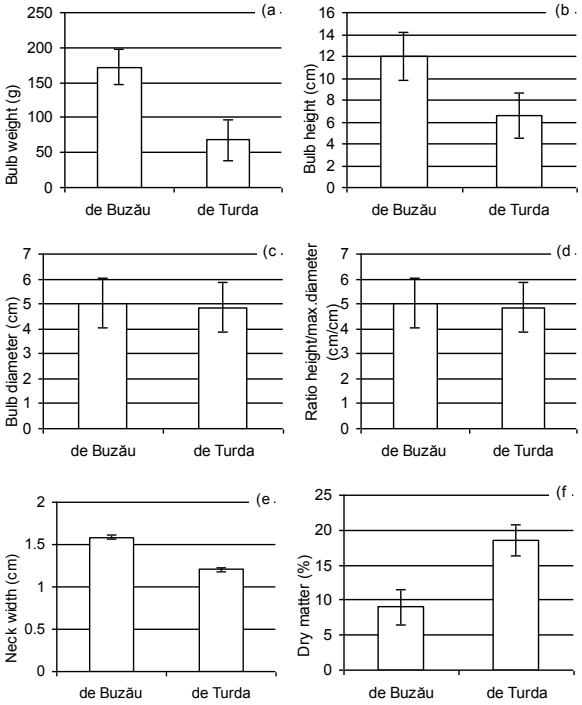

Fig. 1. Standard bulb measurements for red onion landrace 'de Buzău' and 'de Turda': a) weight (g); b) height (cm); c) maximum diameter (cm); d) ratio bulb height/ maximum diameter (cm/cm); e) width of neck (cm); f) dry matter (%).

Bulb adherence of dry skin after harvest (Standard characteristic no. 21) and *Bulb thickness of dry skin* (Standard characteristic no. 22) are *medium* for both landraces.

The base colour of dry skin is *dark red* without exception for all investigated bulb and therefore both landraces belongs to class 7 according to the Standard characteristic no. 23.

Bulb intensity of base colour of dry skin is *dark* for both landraces (Standard characteristic no. 24).

Hue of colour of dry skin (in addition to base colour) is *reddish* for 'de Buzău' and *purplish* for 'de Turda' according to the Standard characteristic no. 25.

Dry matter. The dry matter ranged between 6.5% to 11.57% with an average of 9.02% for 'de Buzău'. In case of 'de Turda', the average

in dry matter was 18.57%, with a minimum of 16.22% and a maximum of 20.82%. Based on the Standard characteristic no. 29. 'de Buzău' belongs to *low* class and 'de Turda' belongs to *medium* class (fig. 1 f).

Fig. 2. Standard bulb measurements for red onion landrace 'de Buzău' and 'de Turda': a) weight (g); b) height (cm); c) maximum diameter (cm); d) ratio bulb height/ maximum diameter (cm/cm); e) width of neck (cm); f) dry matter (%).

However, the description of these two onion landraces does not fit to that published 40 years ago [10] that supports them high productivity. This discrepancy may be due to the traditional knowledge related to the continuing selection process of seeds or traditional practices that are implemented in the ecosystem of origin based on the local populations demands according to the producers.

Socio – economic vulnerabilities

Both interviews realized with the two producers revealed a common barrier that is trade of onion as a commodity. Thus, even 'de Buzău' is officially recognized, still the lack of a local market do not support the connection between local producers and market place at the region or county level as it is supposed to be [9]. This is essential for the maintenance of these landraces both in Buzău and Cluj counties for coupling the producers to the trade on short trade chain that are highly supported by the European Directive 2010/60/EU. A comparable situation was already published for red onion 'de Făgăraș' where it was registered dramatic socio-economic vulnerabilities supporting the erosion of this landrace [3].

The tax for entering the local market is estimated to be around 12 Euros in both counties for 2014 and 2015. Additionally, taxes for storage or renting a market place are also high (i.e. 150 Euros/month in Buzău and 145 Euros/month in Cluj county). On the other hand, the entering on the market of large retailers is highly supported. However, producers are stimulated to label the commodity as "produced in Romania" compared to "imported commodity" which may have a positive impact for selling these commodities. The value in the market place is higher compared to large retailers due to high taxes for local producers. It can be concluded that there is a lack of commitment for local marketing policy. Still, no mention is regarding the way of defining the commodity. Thus, the recognition of the commodity as autochthonous landraces would be beneficial for producers as it is recognized that the crop is cultivated in the original ecosystem for more than 80 years. This will be consistent with the maintained qualities of the products and will further support the producers for stimulating the trade of these genetic resources as valuable commodities.

The official situation of onion landraces in Romania

The surface cultivated with onion varieties in Romania has changed during the last 25 years. Thus, if in 1990, Romania cultivated 27,231 ha with a total production of 218,525 t only after one year it was cultivated less 24,454 ha with a total production of 225,440 t. After a short decrease of the cultivated area at the national level the onion cultivation was more appreciated and today almost 32,000 ha are cultivated with onion with a better production of 387,000 t for 2014 [13]. The cultivated onion varieties are mostly of import origin and classical agricultural practices that are using pesticides are in place. The areal of origin of onion autochthonous landraces are under threat due to the lack of trade policy at the local level. The lack of promotion on the local market place may support the disappearance of the traditional knowledge related to these valuable genetic resources for food and agriculture. To this we add the uncontrolled seeds exchange as 'traditional seeds' and not considering the

value of autochthonous landraces for the future onion breeding programme.

The landrace 'de Turda' was officially recognized starting with 1952 together with 'Roșie de Făgăraș' and 'de Arieș'. All three autochthonous landraces have been considered as valuable landraces being cultivated for more than 100 years in the same ecosystem. Therefore, due to similar characteristics, have been placed under the same position with different names, into the Annex of the Official catalogue for plant varieties in 1952. The landrace 'de Buzău' was recognized for its value in 1977 and continue also today. However, no onion landraces are today recognized for their value in the ecosystem of origin, that are politically supported according to the European regulatory framework in this domain such as the following: Directive 2008/62/EC; Directive 2009/145/EC and Directive 2010/60/EC.

In the national programme for *ex situ* conservation belonging to the Gene Bank Suceava, no accessions have been registered for 'de Buzău' or 'de Turda'. One landrace was homologated by the Research Station for Research and Development in Vegetables Buzău: 'Rubiniu' in 2009, that was breed based on the autochthonous landrace 'de Buzău'.

The evaluation of status of conservation is based on the proposed methodology in 2011 [1].

Thus, for 'de Turda', the cultivar may be considered as *endangered within on farm* the fourth category of vulnerabilities and it is threatened with *on farm* extinction if no administrative and financial measures will be adopted. Such measures should promote short chains of micro-economy in the place of origin of this landrace according to the European framework. On the other hand, 'de Buzău' it is in a better status as it is officially recognized but still due to concrete negative socio-economic vulnerabilities it is *vulnerable on farm*. As it was reflected in the proposed methodology such genotypes are not endangered but need their including into breeding and conservation programmes to ensure that *on farm* conservation is effective. Even 'de Buzău' it is included in the breeding programme (e.g. 'Rubiniu' red onion cultivar is released in 2009 based on 'de Buzău') still no measures are in place for *on farm* conservation of this landrace.

CONCLUSIONS

Both landraces, provided from the ecosystem of origin, 'de Buzău' and 'de Turda' proved to reveal distinct, uniform and stabile characteristics based on the UPOV Standard TG/46/7 and should be recognized as autochthonous landraces under conservation for the region of origin. Based on the analysis of these results it can be considered that today there are no recognition in our country for autochthonous landraces for supporting food security at the local level. Such landraces must be further supported to be included into the Official Catalogue as varieties "under conservation" according to the European Union framework.

Moreover, they may be further supported to be maintained *on farm* in their ecosystem of origin based on consistent socio-economic policies at regional level. There is a lack in the national strategy for plant genetic resources conservation for food and agriculture regarding the use of term 'autochthonous landrace' and 'traditional seeds' that may fuel the erosion of all autochthonous landraces still existing in marginal ecosystems posing a major threat on food security to the country.

Both landraces may be listed under the Red List of plant varieties for Romania according to the proposed methodology that was published in 2011.

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