

STUDY THE MORPHOLOGY OF *ASIMINA TRILOBA* (L.) DUNAL FRUITS AND SEEDS OBTAINED IN THE TRANSYLVANIA REGION OF ROMANIA

Beatrice Agneta Szilagy^{*}, Florin Stănică^{**}, Silvana Mihaela Dănăilă-Guidea^{***}

^{*} S.C. Garden Design S.R.L., 7/34 Hortensiei st., 430294, Baia Mare, Romania, Phone: +4 0744.786.455

E-mail: beatrisce16@yahoo.com

^{**} University of Agronomical Sciences and Veterinary Medicine Bucharest, Faculty of Horticulture, 59 Mărăști Blvd, 011464, Bucharest.

E-mail: flstanica@yahoo.co.uk

^{***} University of Agronomical Sciences and Veterinary Medicine Bucharest, Faculty of Biotechnologies, 59 Mărăști Blvd, 011464, Bucharest.

E-mail: silvana.danaila@yahoo.com

Abstract

The fruit tree *Asimina triloba* (L.) Dunal originates in the temperate zones of North America. Its fruits are edible and have great nutritional value. The fruits' commercial potential contributes to a growing demand for information about this plant in Romania. A series of morphological observations were performed on the fruits and seeds of *Asimina* plants adapted to the temperate climate of the Transylvania zone of Romania.

Keywords: *Asimina*, fruit, seed.

1. INTRODUCTION

The first document to mention *Asimina triloba* (L.) Dunal dates to 1514 and was written by Spanish explorer Hernando de Soto (Layne, 1996, Pickering, 1879; Sargent, 1890).

It was only after 1900 that it was taken into consideration as a fruit tree and the first work to improve the species began, as well as research into the yield, cultivation and use of the fruits (Stănică and Cepoiu, 2003).

In Europe, *Asimina triloba* has been present in Italy (Padua Botanical Garden) since 1801 (Bellini and Montanari, 1992a, 1992b).

The species was introduced into Romania by an immigrant family (the Suci family) from south-central Transylvania (Pianu de Sus, Alba County), who in 1926 returned from the American state of Ohio with a number of *Asimina triloba* fruits and seeds (Stănică, 2012).

In southern Romania, *Asimina triloba* fruits reach maturity in the second half of August, but in some years, fruit ripening lasts until the beginning of October. The fruits are oblong-cylindrical, 15-20 cm long, often asymmetrical but also of different shapes (some are globular, while others lengthy or arched). They weigh from 50g to 500g, or even 1kg. The texture and look of the pulp closely resembles that of bananas, mangoes or pineapples. Their mature color is yellowish-orange, with a delicious taste in the Sunflower variety. The skin is smooth, thin and light green, acquiring a yellowish-green or yellowish hue after ripening (Cepoiu et al., 2003).

A pomological evaluation of the *Asimina triloba* varieties found that the productivity and quality of the Sunflower variety fruits should be taken into consideration (Dănăilă-Guidea, 2004).

The fruit was depicted in several drawings by John James Audubon around 1827 (Szilagyi et al., 2015).

The number of seeds varies and ranges between 5-10 per fruit, with a linear arrangement along the length of the fruit. They are of various shapes and easily separated from the pulp when mature. They germinate very slowly and the proportion that in fact sprout can be as low as 25% after the second harvest year (Dănăilă-Guidea, 2004), if they are not maintained in optimal stratification conditions.

Given the reproduction and domestication of the *Asimina triloba* species in Transylvania (at Lăpușel), a 6-year study began in 2009. This involved a series of morphological observations, with measures of the length and diameter of the fruits, as well as the weight, length and width of the seeds in different years of study. Lăpușel is some 7 km southwest of Baia Mare. The predominant soil type in the region is podzolic (Stanciu, 1992).

2. MATERIALS AND METHODS

In order to determine the morphological characteristics of *Asimina triloba* fruits produced in Transylvania (north and central Romania), we measured the fruits gathered from trees aged 15 and grown at Lăpușel. Attempting to determine the differences in growth of the fruits in the period of vegetation, the measurements were done at two different times: June and October. Using a digital calipers, we determined the length and diameter of *Asimina triloba* fruits. In order to ensure the precision and accuracy of the observations recorded, measurements were taken for six consecutive years (2009-2014). The morphological characteristics were determined by measuring all fruits obtained in each experimental year.

The seeds obtained after a preliminary evaluation were measured and weighed with an electronic scale; their weight (g), length (cm) and width (cm) were all determined. We decided that the number of seeds to be biometrized annually would be 72.

3. RESULTS AND DISCUSSIONS

As this species was only recently acclimated to Romania and as there are climatic differences in Romania's various regions, we considered it necessary to record climatic conditions in Lăpușel during the period observations were undertaken (Table 1).

Table 1. Environmental conditions in Lăpușel (NW Romania), 2009-2014

Year	Climate factors (average annual values)		
	Average temperature (°C)	Atmospheric humidity (%)	Wind speed (km/h)
2009	10.9	77.7	7.5
2010	11.0	73.6	8.2
2011	10.5	78.9	8.2
2012	10.2	70.5	7.9
2013	10.8	72.6	7.8
2014	11.0	76.0	7.7
Average	10.7	74.8	7.8

Analyzing the morphological results obtained following measurements taken in 2009-2014, we determined that during the summer season (June), the average length of *Asimina triloba* fruits was 6.4 cm, while their diameter was 3.3 cm (Table 2). The differences between fruit characteristics are illustrated in Figure 1.

Table 2. Morphological results regarding the characteristic of fruits in mature (15 year old) *Asimina triloba* plants (Lăpușel, NW Romania)

Year	Summer season (June)		Autumn season (October)		Difference in growth (cm)	
	Length (cm)	Diameter (θ)	Length (cm)	Diameter (θ)	Length (cm)	Diameter (θ)
2009	4.1	2.2	8.6	4.2	4.5	2.0
2010	5.8	3.5	7.4	4.3	1.6	0.8
2011	7.6	3.7	12.2	5.8	4.6	2.1
2012	6.7	3.8	8.1	4.8	1.4	1.0
2013	7.5	3.1	9.5	3.8	2.0	0.7
2014	6.9	3.6	8.5	4.5	1.6	0.9
Average	6.4	3.3	9.1	4.6	2.4	1.1

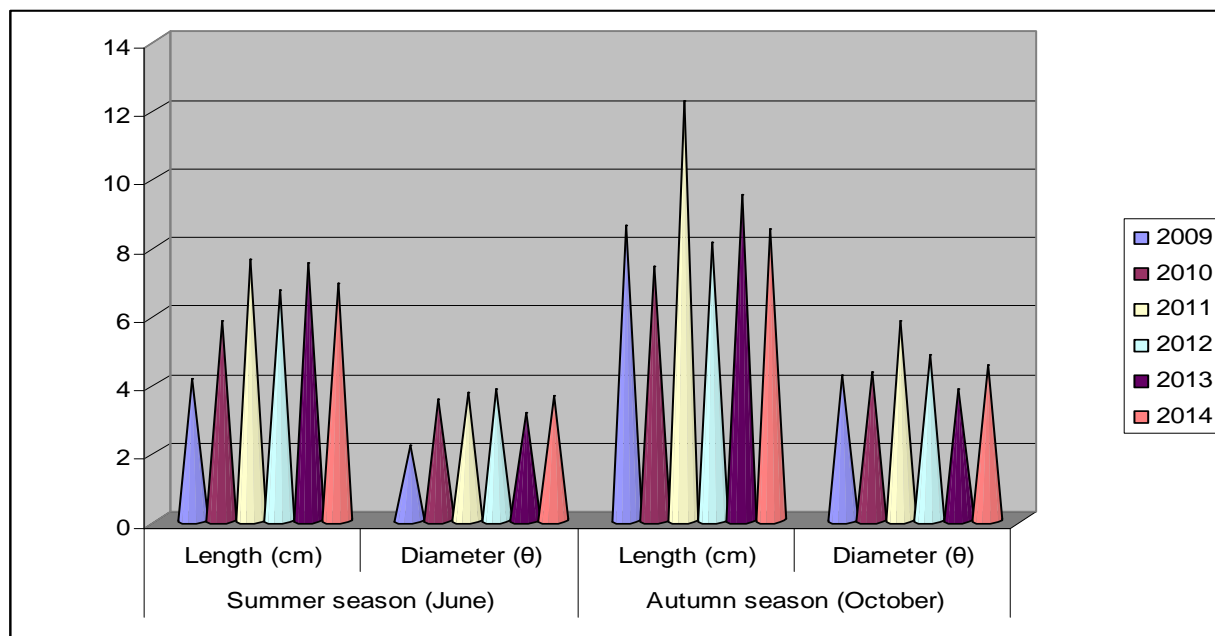


Figure 1. The differences between *Asimina* fruit characteristics harvested in the 2009-2014 period (Lăpușel, NW Romania)

The appearance of *Asimina* fruits harvested in autumn 2012 is illustrated in the Figure 2.



Figure 2. *Asimina* fruit aspect harvested in 2012 autumn season from trees located in Transylvania region (original photos by Dănăilă-Guidea S. M.)

Once fruit growth and development stops in autumn (October), the average obtained after monitoring growth in length was 9.1 cm, while growth in diameter for the average value was 4.6 cm. For *Asimina* seeds monitored, the results obtained after undertaking observations and biometric determinations are presented in Table 3.

Table 3. Morphological results obtained from the seeds of *Asimina triloba* fruits at Lăpușel (NW Romania)

Morphological characteristics	2009	2010	2011	2012	2013	2014	Average values
Seed mass (g)	1.30	1.44	1.64	1.47	1.65	1.58	1.51
Seed length (cm)	2.59	2.57	2.63	2.55	2.69	2.51	2.59
Seed width (cm)	1.36	1.30	1.34	1.35	1.32	1.33	1.33

From a morphological viewpoint, it was determined that the seeds taken from *Asimina triloba* fruits coming from 15 year old plants in northern Romania had an average length of 2.59 cm, an average width of 1.33 cm and an average mass of 1.51 g (Table 3).

4. CONCLUSIONS

The results of morphological observations on *Asimina triloba* fruits in Transylvania (north and central Romania) showed that at the moment of consumption maturity, average fruit length is between 7.4 cm (2010) and 12.2 cm (2011), which implies a heightened variability.

We consider that one factor influencing the differences recorded from year to year in growth of length and mass of fruits were the climate conditions in Lăpușel (NW Romania) during the experiment period analyzed, 2009-2014. Their seeds had the mass and dimensions pertaining to plants in the zone of origin.

5. REFERENCES

- Bellini, E., Montanari, D. (1992a). La coltura dell' *Asimina* in Italia. Esperienze maturate a Faenza. *L'informatore Agrario*, (45); 51-64.
- Bellini, E., Montanari, D. (1992b). La coltura dell' *Asimina* (*Asimina triloba*), *Annonaceae* per i climi temperati. *L'Informatore Agrario*, XLVIII (38); 59-72.
- Cepoiu, N., Roșu, A., Dănăilă-Guidea, S. M., Păun, C. (2003). *Asimina*, o specie pomicolă de viitor pentru România. *Agricultorul român*, 10(58), 13-15.
- Dănăilă-Guidea, S. M. (2004). Pawpaw, (*Asimina triloba* L. Dunal), o specie pomicolă cu reale perspective pentru România. În: *Hortinform*, 11/147, 25-28.
- Layne, D.R. (1996). The pawpaw [*Asimina triloba* (L.) Dunal]: A new fruit crop for Kentucky and the United States. *HortScience*, 31(5), 777-784.
- Pickering, C. (1879). Chronological history of plants, p. 881. Little, Brown, and Co., Boston.
- Sargent, C.S. (1890). *Silva of North America*. Houghton Mifflin Co., New York.
- Stanciu, I. (1992). Așezarea prefeudală de la Lăpușel, județul Maramureș. *Cercetări arheologice din anii 1992-1993*, pp.267-322.
- Stănică, F., Cepoiu, N. (2003). Northern banana - a new fruit specie in Romania. În *Lucrări Științifice U.S.A.M.V.B., seria B.*, XLVI, 208-211.
- Stănică, F. (2012). *Asimina triloba* (Pawpaw) Germplast in Romania. În: *Lucrări Științifice U.S.A.M.V.B., seria B*, LVI, 267-272.
- Szilagyı, B. A., Mare-Roșca, O., Dănăilă-Guidea, S. M. (2015). *Potențialul ecopeisagistic al spațiilor verzi intravilane din municipiul Baia Mare (Maramureș)*, pp. 176. București: Ed. Ex Terra Aurum, București.