



## VARIATION IN QUANTITATIVE SEED TRAITS OF *ECHINOCYSTIS LOBATA* (MICHX.) TORR. ET A. GRAY (CUCURBITACEAE)

MARINA GOLIVETS

**Abstract.** The variation in quantitative seed traits of *Echinocystis lobata* has been studied.

**Key words:** *Echinocystis lobata*, seed trait, phenotypic variability

*Institute for Evolutionary Ecology, National Academy of Sciences of Ukraine, Lebedeva str. 37, 03143 Kyiv, Ukraine; marina.golivets@gmail.com*

### Introduction

*Echinocystis lobata* (Michx.) Torr. et A. Gray (Cucurbitaceae) is an annual vine that can climb up to 6(12) m. The species is native to North America, where it grows in woodlands and in the littoral zone of inland surface water bodies. In the early XX century it was brought to Europe as an ornamental and medical plant. In a short while since the first introduction, the species escaped from cultivation and eventually became increasingly invasive over the last 20 years (KLOTZ 2007). A high intrapopulation variation of seed traits has been observed in the native range (VINOGRADOVA *et al.* 2009).

However, studies on phenotypic variability of the species in its secondary range are not known to this date. For this reason, I have conducted a pilot study aiming at testing variability of quantitative seed traits among individuals of *E. lobata*.

### Material and methods

Mature seeds of *E. lobata* were obtained from five localities within Kyiv region during the period between 2011 and 2013. Seeds were collected from 5-23 randomly selected individuals per local population and stored separately. Number of seeds per population varied from 38 to 347, and 703 seeds were analyzed in total. Seven quantitative

morphological seed traits were involved in the analysis: seed area (SA, mm<sup>2</sup>), seed perimeter (SP, mm), seed length (SL, mm), seed width (SW, mm), seed length/width ratio (LWR), seed circularity (SC), and seed biomass (SB, g). Seed dimensions were obtained during the digital image analysis with application of SmartGrain Version 1.1 software package (TANABATA *et al.* 2012).

In addition, seed color was defined visually and scaled from 1 to 3 according to the intensity of black. Seed trait variability within individuals was assessed by coefficient of variation (CV, %). For multivariate statistical treatment the standardized data of quantitative seed traits was taken for calculations. The significance of the difference between trait mean values among individuals was tested by one-way analysis of variance (ANOVA). All statistical treatment was carried out in MS Excel and Statistica 6.0 (StatSoft Inc. 2001).

### Results and discussion

SA varied from 2,80 to 19,35% within the studied individuals, SP – 1,16-14,11%; SL – 1,20-12,25%; SW – 1,40-9,75%; LWR – 1,47-11,04%; SC – 0,76-13,32%; SB – 3,64-21,61%. ANOVA has revealed a significant difference among individuals of *E. lobata* across all the studied traits (Tab. 1). The greatest variation has been detected for SA and SB. According their color, 13,9% of seeds

**Table 1.** Descriptive statistics and summary of ANOVA showing the variation of seed traits among *Echinocystis lobata* individuals.

| Trait | Mean    | Min    | Max     | MS    | F      | p    | CV, % |
|-------|---------|--------|---------|-------|--------|------|-------|
| SA    | 105,804 | 47,896 | 156,688 | 7,925 | 20,455 | 0,00 | 16,22 |
| SP    | 44,208  | 28,923 | 62,282  | 6,972 | 14,787 | 0,00 | 9,96  |
| SL    | 17,490  | 10,705 | 22,356  | 7,789 | 19,498 | 0,00 | 10,91 |
| SW    | 8,239   | 6,009  | 10,344  | 7,272 | 16,339 | 0,00 | 7,71  |
| LWR   | 2,125   | 1,488  | 2,924   | 7,341 | 16,724 | 0,00 | 9,14  |
| SC    | 0,680   | 0,323  | 0,801   | 4,218 | 5,904  | 0,00 | 7,11  |
| SB    | 0,283   | 0,114  | 0,438   | 7,483 | 17,547 | 0,00 | 19,19 |

were ranked as 1; 58,2% – as 2; and 27,9% – as 3. Thus, the analysis of quantitative seed characteristics showed a high variation among single individuals of *E. lobata*.

The next step will be a thorough analysis of qualitative and quantitative seed traits of the species in its secondary range.

## References

- KLOTZ S. 2007.** *Echinocystis lobata*. DAISIE. [http://www.europe-aliens.org/pdf/Echinocystis\\_lobata.pdf](http://www.europe-aliens.org/pdf/Echinocystis_lobata.pdf)
- TANABATA T., SHIBAYA T., HORI K., EBANA K., YANO M. 2012.** SmartGrain: High-throughput phenotyping software for measuring seed shape through image analysis. *Plant Physiol.* **160** (4): 1871–1880.
- VINOGRADOVA Y.K., MAYOROV S.R., KHORUN L.V. 2009.** The Black Data Book of the flora of Middle Russia. GEOS, Moscow. (in Russian)