



UDC 582.097:581.1(477)

DOI: 10.31548/dopovidi/4.2025.09

## Features of growth and generative development of *Campsis radicans* (L.) Seem. ex Bureau in the conditions of the Northern Black Sea region

**Olga Korolyova\***

PhD in Biological Sciences, Associate Professor  
Petro Mohyla Black Sea National University  
54000, 10 68 Desantnykyv Str., Mykolaiv, Ukraine  
Mykolaiv National Agrarian University  
54008, 9 Georgiy Gongadze Str., Mykolaiv, Ukraine  
<https://orcid.org/0000-0003-0429-1135>

**Abstract.** The need to control the spread of introduced species with high adaptive potential in new ecological conditions necessitates the study of their biological properties. The aim of the study was to establish the biological characteristics of *Campsis radicans* (L.) Seem. ex Bureau plants in the Northern Black Sea region with the possibility of determining their potential ability to naturalise. The research material consisted of collections of *C. radicans* fruits and seeds, as well as observations of 40 *C. radicans* individuals of different ages, carried out during 2023–2025. The research found that *C. radicans* individuals go through three ontogenetic periods and seven age stages in their development. The vegetation period of *C. radicans* in the studied area lasts 240 days. *C. radicans* is characterised by a late start and end of vegetation and belongs to spring-summer-autumn green plants. It has been established that the carpological characteristics of *C. radicans* are consistent with the species norm. The fruits of *C. radicans* were 8–20 cm long (14.3 cm on average) and 2.0–3.3 cm wide (2.5 cm on average). The linear parameters of the seeds were 0.4–0.8 cm in length (0.5 cm on average) and 0.6–0.9 cm in width (0.8 cm on average). The weight of 1,000 seeds was 3.4 g. It was determined that the studied plants produced high-quality seed material. The germination and germination energy indicators of seeds in laboratory conditions were higher than in field conditions (94 and 90%, 86% and 77%, respectively). The acclimatisation index calculated according to four criteria was 90 points, which corresponds to the full degree of acclimatisation of *C. radicans* in the Northern Black Sea region. The identified features of growth and generative development of *C. radicans* indicate the significant adaptive capabilities of the species

**Keywords:** *Campsis radicans*; ontogenesis; seed sowing qualities; degree of acclimatisation; seed renewal

### Suggested Citation:

Korolyova, O. (2025). Features of growth and generative development of *Campsis radicans* (L.) Seem. ex Bureau in the conditions of the Northern Black Sea region. *Scientific Reports of the National University of Life and Environmental Sciences of Ukraine*, 21(4), 9–18. doi: 10.31548/dopovidi/4.2025.09.

\*Corresponding author



Copyright © The Author(s). This is an open access article distributed under the terms of the Creative Commons Attribution License 4.0 (<https://creativecommons.org/licenses/by/4.0/>)

## Introduction

*Campsis radicans* (L.) Seem. ex Bureau, (*C. radicans*) – a woody deciduous vine of the *Bignoniaceae* family, which has high decorative qualities and is widely used for vertical gardening. Climbing up vertical supports, the plant forms decorative additions to the architecture in places where it is impossible to plant trees and shrubs. The species is characterised by very rapid, even aggressive growth in its natural habitat, so it was important to study its biological characteristics in the area of introduction. According to the POWO (Plants Of the Word Online) database (2025), the natural range of *C. radicans* is eastern and central North America. According to R.E. Mokni & D. Iamónico (2024), the vine is grown as an ornamental introduction in South America (Argentina and Ecuador), Europe (Belgium, Croatia, Germany, Italy), North Africa (Algeria, Libya, Tunisia), etc. In Europe, *C. radicans* was introduced in the 17<sup>th</sup> century, and since the 19<sup>th</sup> century it has been successfully cultivated in Ukraine, as noted by L.I. Boiko *et al.* (2024). In addition to its landscaping function, *C. radicans* is known as a good honey plant and, as G. Graves (2022) points out, plays a significant ecological role as a food source for rare and endangered bird species. The author of the work noted that the biological and geographical characteristics of *C. radicans* make the plant a promising model object for studying the influence of pollinating birds on pollination mechanisms and the evolution of floral traits. The biology of *C. radicans* pollination, namely the causes and consequences of the effect of heterospecific pollen on stigma behaviour, is also discussed in the work of T.-T. Zou *et al.* (2022).

*C. radicans* plants have attracted the attention of researchers as a source of biologically active substances. In the work of M. Islam *et al.* (2020), the biochemical composition of the green mass of *C. radicans* was studied in terms of its pharmacological potential. The authors isolated five triterpene compounds, pharmacologically valuable secondary metabolites. M. Ramtin *et al.* (2022) investigated the active ingredient of *C. radicans* bark essential oils and evaluated its antimicrobial activity against

resistant strains of some pathogenic bacteria and fungi. Studies by S. Tufail *et al.* (2022) and K. Bhadrwaj *et al.* (2022) showed that the flowers and leaves of *C. radicans* have significant potential for the synthesis of silver nanoparticles with pronounced antibacterial and antioxidant activity, which has promising applications in biomedicine and biotechnology. T. Karaduman Yesildal & C. Soyukan (2024), while studying the potential therapeutic properties of *C. radicans* extracts, found that the plant has cytotoxic properties against human colon adenocarcinoma cells, as well as high antioxidant capacity. In a review study by K.U. Killi *et al.* (2024), dedicated to revealing the biomedical potential of *C. radicans*, an overview of the therapeutic use of this plant in inflammatory processes, in the treatment of cancer and prospects for use in neurology and cardiology is presented. It was also noted that similar approaches to the study of chlorophyll synthesis processes and the influence of agrotechnical factors on their dynamics are presented in the work of L.M. Burko (2020). Thus, given the antimicrobial, antiproliferative and antioxidant effects established by a number of authors, herbal medicines based on *C. radicans* can be considered as an alternative to chemical preparations, and the plant itself can be cultivated for use in official medicine in the future.

Information on the biological characteristics of *C. radicans* under introduction conditions is limited. In the monograph by L.I. Boiko *et al.* (2024), the successful introduction of *C. radicans* and its widespread use in vertical greening of Ukrainian cities among other species of woody vines was reported. The authors indicated that *C. radicans* belongs to thermophilic, fairly drought-resistant vines with highly decorative leaves and flowers that cling to supports with their roots, and is fully acclimatised to the conditions of the Kryvyi Rih Botanical Garden. As shown by the Lady Bird Johnson Wildflower Centre (2024), *C. radicans* demonstrates vigorous and rapid, even aggressive growth in its natural habitat, destroying stones, wood and bricks. According to the Global Invasive

Species Database (n.d.), the plant does not have invasive status, but given the above, the species has pronounced invasive properties. The aim of the study was to investigate the biological characteristics of *C. radicans* plants, in particular their growth, development, and seed sowing qualities in laboratory and field conditions in terms of their acclimatisation in the Northern Black Sea region.

### Materials and Methods

The materials used in the study were plants of various ages, ripe fruits and seeds of *C. radicans*. Field studies were conducted during 2023-2025 at the experimental site of the Department of Plant Growing and Landscape Gardening of Mykolaiv National Agrarian University (observation of 1-2-year-old plants), as well as in 12 localities in the city of Mykolaiv (observation of virginal and generative age plants). The surveyed collection sites included residential areas and park zones in the Zavodskiyi, Tsentralnyi, Ingulskiyi and Korabelnyi districts of Mykolaiv; the degree of anthropogenic impact on the studied habitats was moderate. The fruits were collected from generative individuals of *C. radicans* in the specified locations in October-November 2023 and 2024, after their natural ripening. Laboratory studies were carried out at the Educational and Scientific Laboratory of Microbiology, Virology and Immunology of Petro Mohyla Black Sea National University.

To determine the developmental characteristics of *C. radicans*, plants were studied in the latent (seeds), pre-generative (30 plants; criterion for classification into the period – from the moment of seed germination) and generative (10 plants; criterion for classification into the period – from the moment of the beginning of the formation of generative shoots) ontogenetic periods. In the latent period of ontogenesis, *C. radicans* seeds were studied; in the pregenerative period, *C. radicans* plants were studied in the seedling, juvenile, immature, and virginal age states; in the generative period, they were studied in the young generative, middle generative, and old generative stages. Anatomical and morphological studies were

conducted using light microscopy with the preparation of temporary micro-preparations. A total of 40 *C. radicans* individuals of different ages at various stages of ontogenesis were examined. The following biological parameters of plants characterising the generative development of *C. radicans* were analysed: morphometric parameters of fruits and seeds, weight of 1,000 seeds, germination and seed germination energy.

The fruits of *C. radicans* were collected at the stage of their natural ripeness, by random sampling of 20 fruits per plant, for a total of 200 fruits. The length and width of the fruits were measured using a ruler, and the weight of the fruits was measured using electronic scales with an accuracy of 0.01 g. To study the morphobiological characteristics of the seeds, 2,500 seeds were processed. The seeds were manually removed from the fruits and air-dried; a ruler was used to measure the linear dimensions of the seeds, and electronic scales with an accuracy of 0.01 g were used to measure the weight of 1,000 seeds. Mathematical calculations were performed using Statistics 17 software. The work uses generally accepted methods for determining seed quality, in particular the weight of 1,000 seeds is determined in accordance with DSTU 5036:2008 (2008), and the sowing quality of seeds was determined in accordance with V.M. Maurer & A.I. Kushnir (2008) and DSTU 8558:2015 (2015).

The weight of 1,000 seeds was used as an indicator characterising the viability, size and uniformity of the seeds. The sowing qualities of the seeds – germination and germination energy – were studied in laboratory conditions and in open ground; the number of seeds selected for each procedure was 100. Germination and germination energy were determined in accordance with the technical conditions of standard DSTU 8558:2015 (2015). In laboratory conditions, the seeds were germinated in a thermostat at a temperature of 25°C with a 12-hour photoperiod. To study the growth characteristics and sowing qualities of *C. radicans* seeds in field conditions, the seeds were planted in open ground in the

third decade of April using the tape method; the distance between rows was 45 cm, the length of rows was 100 cm, the number of seeds per row was 20, and the number of rows was 5. The degree of acclimatisation of *C. radicans* in the study area was evaluated based on growth and generative development indicators using the acclimatisation number method according to the scale of M.A. Kochna and O.M. Kurdyuk (Shlapak *et al.*, 2019). The study was conducted in accordance with the Convention on Biological Diversity (1992).

## Results and Discussion

This study found that reproductive individuals of *C. radicans* successfully pass through all stages of development and age in the conditions of introduction in the Northern Black Sea region. During the latent period of ontogenesis of *C. radicans*, morphometric indicators and sowing qualities of seeds were studied. *C. radicans* seeds are round-triangular, flat, with a thin seed coat and two winged wings. The morphometric parameters of the seed are 0.4-0.8 cm in length (average value  $0.5 \pm 0.04$  cm) and 0.6-0.9 cm in width (average value  $0.8 \pm 0.03$  cm). The weight of 1,000 seeds is  $3.4 \pm 0.04$  g. The established carpopological characteristics of *C. radicans* correspond to the species norm. Laboratory germination and seed germination energy are high, amounting to 94% and 90%, respectively, while field germination and seed germination energy are 86% and 77%. The germination phase begins immediately after sowing and lasts for 4-7 days until the cotyledon leaves appear. Germination is characterised by the appearance of cotyledon leaves on the soil surface, followed by juvenile leaves after the cotyledon leaves die off. Cotyledon leaves appear on average 6 days after sowing the seeds.

Juvenile leaves appear on average 11 days after the cotyledon leaves open. Juvenile leaves are simple, with an average length of 2.0-2.5 cm and a width of 2.0 cm. During this period, the plant has leaves with a shadow anatomical structure, weak mesophyll development, no differentiation into columnar and palisade parenchyma,

weak venation development, and a small number of stomata per unit area. The transition of *C. radicans* plants to the immature state is evidenced by the formation of 8 or more true leaves, the presence of opposite leaf arrangement, and intensive growth of the main shoot. The formation and growth of the root system is intensified (the length of the main root averaged 20 cm), lateral roots are formed (on average, there were 20 of them). The average length of the leaves of virgin plants is 4-5 cm, and the width is 2.7 cm.

The virginal state in the ontogenesis of *C. radicans* lasts until the onset of the budding phase. Virginal plants are characterised by typical leaves in shape and size and the absence of generative shoots. The root system of *C. radicans* is of the al-lorizic type, taproot with well-developed main and lateral roots. Under the conditions studied, the root system of young plants is of the superficial-anchor type with roots concentrated in the soil horizon up to 42 cm. In the absence of support, the plant actively takes root. Certain features were found in the anatomical structure of the stem. The non-lignified shoots of *C. radicans* have a primary structure. The epidermis of *C. radicans* consists of a single layer of cells that are slightly elongated, with relatively thick straight walls. There are juvenile hairs on the surface of the stem. Under the epidermis, the primary cortex is differentiated, consisting of thin-walled parenchyma chlorophyll-bearing cells in which photosynthesis occurs. The peripheral layers of cells of this tissue are represented by collenchyma, which is located in a uniform layer or separate zones. The endoderm of *C. radicans* is represented by a starch-bearing sheath – it consists of a single layer of cells containing starch grains. Behind the endoderm, towards the centre of the stem, is the central cylinder, the main structural elements of which are the pericycle, the vascular tissue zone and the pitha.

The pericycle is the outer boundary of the axial cylinder and is located directly beneath the endoderm. Behind the pericycle is the conductive tissue of the central cylinder, which in *C. radicans* is represented by open collateral vascular-fibrous

bundles. In their primary structure, they consist of primary xylem (closer to the centre) and primary and secondary phloem (closer to the periphery). The pith in the primary structure of the *C. radicans* stem is well developed and occupies its central part. It consists of large parenchyma cells with intercellular spaces. The cells of the pith are cylindrical with very thin cellulose walls. The central cylinder also includes primary pith rays, which are located between the vascular-fibrous bundles and separate them. In addition, the pith rays connect the pith with the primary cortex. The formation of the secondary structure of the stem in *C. radicans* begins in early summer with the laying of the cambium and the formation of secondary conductive tissues in the central cylinder of 1-year-old shoots. The formation of the periderm in Mykolaiv occurs later, in October-November, so the green shoots of the first year have primary covering tissue, a typical structure of the primary cortex, but already formed cambium from the procambium and secondary xylem and phloem. Parenchymatic rays in *C. radicans* are well developed in both phloem and xylem and heartwood. As indicated by J.C. Raulston & G. Grant (1994) and K.S. Rajput *et al.* (2018), in further development in perennial stems, the heartwood is completely replaced by secondary xylem and intrasaxillary secondary phloem.

Anatomical and morphological studies of the leaf blade of virginal plants *C. radicans* showed that the studied plants have a dorsoventral leaf structure with a single-layer upper and lower epidermis. The epidermal cells are relatively large,

with thin walls. The central vein is more or less rounded, with a developed keel on the abaxial side and a groove on the adaxial side. The epidermis is single-layered, with collenchyma underneath. The mesophyll consists of parenchyma cells, weakly differentiated into multilayered columnar and spongy parenchyma. The leaf's conducting bundles are collateral, with well-developed xylem and phloem. The leaf of *C. radicans* is flat, and the veins on the abaxial side protrude strongly above the surface of the leaf blade. In large veins, the cells of the main parenchyma are large, with thin walls and intercellular spaces; the conducting bundles of the leaf are collateral; the collenchyma is well developed on the side of the veins. There is weak pubescence on the leaf: trichomes are few, simple, hook-shaped with a broad base, located singly along the edges of the leaf and on the veins on the underside of the leaf. Thus, the leaf of *C. radicans* has xerophytic structural features. According to S. Wennerberg (2004), the transition to the generative period in *C. radicans* occurs 4-6 years after sowing the seeds, or 2-3 years in the case of rooting cuttings. Plants in the generative period were studied in natural conditions at the research site. The generative period is characterised by the formation of flowers, the formation and ripening of seeds and fruits, and in the phenological spectrum includes the phases of budding, flowering, and fruiting (Table 1). The duration of the period from the end of flowering to fruit ripening averaged 51 days over 2 years of observation.

**Table 1.** Phenological range of *C. radicans* in the Northern Black Sea region in 2023-2025

Phenological phase	April	May	June	July	August	September	October	November	December
Shoot growth		■	■	■	■	■	■		
Budding			■	■	■	■			
Flowering				■	■	■	■		
Fruiting					■	■	■	■	■
Relative dormancy									■

**Source:** compiled by the author

The flowering phase in generative individuals of *C. radicans* begins when the effective temperature exceeds +25°C and the average daily temperature is +21°C–+26°C, which in Mykolaiv occurs in the second ten days of June and lasts until the autumn frosts and a decrease in the average daily temperature. Flowering in *C. radicans* is gradual and abundant, which gives the plants high decorative value and expands the possibilities of its use in green construction. The fruiting phase in generative individuals of *C. radicans* begins in the third decade of July and lasts until the end of November. The fruit of *C. radicans* is solitary, dehiscent, pod-like with a partition, leathery walls, and greyish-brown in colour when ripe. By measuring the morphometric parameters of the fruits, it was established that in the studied area, *C. radicans* forms fruits ranging in size from 8 to 20 cm in length (average value 14.3±0.1 cm), from 2.0 to 3.3 cm in width (average value 2.5±0.1 cm), and up to 5 cm in diameter. The average fruit weight is 9.0±0.2 g. The smallest number of seeds in a fruit is 39, and the largest is 388. Ripe fruits open along the side seams, and seeds are dispersed by anemochory.

Observation of the natural seed renewal of *C. radicans* in the studied localities showed that the plant forms self-seeding, which germinates in the spring of the year following fruiting. The spread of self-seeding has certain peculiarities – seedlings were found both directly near the parent plants and beyond their boundaries. Studying the peculiarities of the seasonal rhythm of development and the duration of the phenological phases of the plant under conditions of introduction is of great importance for assessing the success of its acclimatisation. The studied species belongs to the group of spring-summer-autumn green plants with a late start and late end of vegetation. The beginning of plant vegetation is observed in the second decade of April at an average daily temperature of over +13°C. The end of vegetation is observed at the end of November. The duration of the growing season of *C. radicans* in the conditions of the Northern Black Sea region is 240 days.

The acclimatisation index, calculated on the basis of four indicators, is 90 points, which indicates the complete acclimatisation of *C. radicans* in the conditions of the Northern Black Sea region. The plant goes through all ontogenetic periods and age stages (growth indicator – 5 points), produces completely similar seeds (generative development indicator – 5 points), has good winter hardiness with possible partial freezing of annual shoots (winter hardiness index – 4 points), and has excellent drought resistance (5 points).

Given the established ontogenetic characteristics, plant development throughout the year, and degree of acclimatisation, *C. radicans* can be considered successfully introduced in the Northern Black Sea region. The high potential for naturalisation in the Northern Black Sea region is primarily indicated by the fact that the plants are capable of successfully reproducing independently, both by seed and vegetatively. The quantitative parameters of seed quality obtained differ slightly from the indicators given in the available information sources. Thus, the fruit length established in this study varies significantly from 8 to 20 cm, while according to S. Wennerberg (2004) in the natural range it is 8–13 cm. The weight of 1,000 seeds in the studied plants was slightly lower than according to D. Chachalis & K.N. Reddy (2000) – 3.4 g and 4 g, respectively; the same applies to the average number of seeds in the fruit – 388 and 696, respectively. However, despite the formation of relatively smaller seeds, high field germination and germination energy rates were observed – both in comparison with our own laboratory data and in comparison with data from other researchers. Thus, D. Chachalis & K.N. Reddy indicate a maximum laboratory germination rate of 74%. Therefore, it can be assumed that *C. radicans* plants in the studied climatic and geographical conditions produce reproducible, high-quality and germinable seeds.

As S. Wennerberg (2004) points out, in its natural region, *C. radicans* is found in thickets, dry forests, wastelands, railway tracks, disturbed areas, clearings, and along roadsides and fences,

i.e. in a wide range of habitats, preferring well-lit areas on sandy, loamy or clayey soils with varying moisture levels and pH ranging from 3.7 to 6.8. A study by X. Jiang-bao *et al.* (2011) on the photosynthetic efficiency of three-year-old leaves in relation to soil moisture and light intensity showed that *C. radicans* is also highly adaptable to light conditions. According to the results of observations, if *C. radicans* plants do not have vertical support, they switch to horizontal growth, spread across the soil surface and take root. The growth characteristics described above illustrate the species' significant ecological plasticity in terms of many growth conditions, which in turn indicates the significant adaptive potential of *C. radicans* in new areas of its distribution.

Under introduction conditions, *C. radicans* has been observed to spread beyond the boundaries of the crop. Thus, according to S. Wennerberg (2004) and J.A. Hurrell *et al.* (2012), throughout the United States, Canada and Argentina, the species grows as a weed, which is why S. Wennerberg (2004) recommends controlling its growth when using the vine in landscaping. In Europe, J. Blanco Salas (2014) reported the first discovery of a wild population of *C. radicans* in the natural environment in the west of the Iberian Peninsula in Spain. E. Raab-Straube & Th. Raus (2019) report on the spontaneous local naturalisation of the species in urban areas of Algeria. In this study, seedlings were observed at a distance from the parent plant, where they are able to withstand competition and develop successfully. Given the anemochorous mode of seed dispersal and the active wind regime in the study area, it is quite possible that seeds are carried beyond the parent plant over significant areas. In urban ecotopes, additional factors may contribute to the spread of *C. radicans* seeds, such as dispersal by motor vehicles, human transport during the cleaning of park areas and streets, etc. Thus, in the conditions of the Northern Black Sea region, *C. radicans* plants of generative age bloom, form viable seeds, produce self-sown seedlings, and are capable of spreading naturally without human intervention.

Overall, the established biological characteristics of *C. radicans* indicate the plant's high potential for naturalisation in the Northern Black Sea region.

## Conclusions

*C. radicans* successfully passes through the latent, pregenerative and generative periods and the age stages of seedling, juvenile, immature, virginal, young generative, middle generative and old generative in ontogenesis. In the conditions of the Northern Black Sea region, the length of the growing season of generative individuals of *C. radicans* is 240 days. In terms of phenological development, *C. radicans* has a late start and late end of vegetation and belongs to spring-summer-autumn green plants. In the conditions of the Northern Black Sea region, *C. radicans* forms fruits ranging from 8 cm to 20 cm in length (average 14.3 cm) and from 2 cm to 3.3 cm in width (average 2.5 cm). The linear dimensions of the seeds vary from 0.4-0.8 cm in length (average 0.5 cm) to 0.6-0.9 cm in width (average 0.8 cm). The average weight of 1,000 seeds was 3.4 g.

Under the introduction conditions of the Northern Black Sea region, *C. radicans* showed effective natural seed reproduction, characterised by abundant and prolonged flowering and the formation of viable and similar seeds. The germination rate and germination energy of *C. radicans* seeds in laboratory conditions were 94% and 90%, respectively, while in field conditions these indicators were 86% and 77%, respectively. The seeds remain viable under natural conditions, thus, when introduced into the Northern Black Sea region, seed reproduction and maintenance of the stability of *C. radicans* populations is possible without vegetative reproduction. The obtained characteristics of growth and generative development of *C. radicans* illustrate the high adaptive capabilities of the species. The acclimatisation index (90 points) indicates the complete degree of acclimatisation of *C. radicans* in the conditions of the Northern Black Sea region. As the results show, *C. radicans* is not only successfully introduced but also has a high potential for naturalisation in the conditions of the

Northern Black Sea region. Given the significant length of the growing season throughout the year, the success of seed reproduction of the plant, as well as the high degree of acclimatisation, the species is potentially risky in terms of biosafety and requires constant monitoring of its spread. Further research prospects include continuing to study the reproductive biology of *C. radicans*.

None.

None.

None.

## Acknowledgements

## Funding

## Conflict of Interest

## References

- [1] Bharadwaj, K., Sharma Jha, B., & Kathpalia, R. (2022). Biofabrication and optimization of silver nanoparticles using *Campsis* sp. to explore their antimicrobial properties. *Indian Journal of Biochemistry and Biophysics*, 59(12), 1176-1183. doi: [10.56042/ijbb.v59i12.67299](https://doi.org/10.56042/ijbb.v59i12.67299).
- [2] Blanco Salas, J. (2014). A new allochthonous species for Extremadura: *Campsis radicans* (L.) Seem. (Bignoniaceae). *Bouteloua*, 19, 28-32.
- [3] Boiko, L.I., Yukhymenko, Yu.S., & Danylchuk, O.V. (2024). Introduction of tree plants in the industrial region of the steppe zone of Ukraine and their use in urban gardening. Kyiv: Talkom.
- [4] Burko, L.M. (2020). Influence of elements of growing technology on the process of chlorophyll synthesis in feed beet leaves. *Plant and Soil Science*, 11(4), 26-33. doi: [10.31548/agr2020.04.026](https://doi.org/10.31548/agr2020.04.026).
- [5] Chachalis, D., & Reddy, K.N. (2000). Factors affecting *Campsis radicans* seed germination and seedling emergence. *Weed Science*, 48(2), 212-216. doi: [10.1614/0043-1745\(2000\)048\[0212:FACRSG\]2.0.CO;2](https://doi.org/10.1614/0043-1745(2000)048[0212:FACRSG]2.0.CO;2).
- [6] Convention on Biological Diversity. (1992, June). Retrieved from [https://zakon.rada.gov.ua/laws/show/995\\_030#Text](https://zakon.rada.gov.ua/laws/show/995_030#Text).
- [7] DSTU 5036:2008. (2008). Seeds of trees and shrubs. Methods of sampling, determination of purity, weight of 1000 seeds and humidity. Kyiv: Derzhspozhyvstandart.
- [8] DSTU 8558:2015. (2015). Seeds of trees and shrubs. Methods of determining seed qualities (similarity, viability, good quality). Kyiv: Derzhspozhyvstandart.
- [9] Global Invasive Species Database (GISD). (n.d.). *Invasive species specialist group of the IUCN species survival commission.* Retrieved from <https://www.iucngisd.org/>.
- [10] Graves, G. (2022). The *Campsis-Icterus* association as a model system for avian nectar-robbery studies. *Scientific Reports*, 12, article number 11936. doi: [10.1038/s41598-022-16237-9](https://doi.org/10.1038/s41598-022-16237-9).
- [11] Hurrell, J.A., Cabanillas, P.R., Costantino, F.B., & Delucchi, G. (2012). Adventitious Bignoniaceae in Argentina. First record of *Podranea ricasoliana* and new records of *Campsis radicans*. *Journal of the Argentine Museum of Natural Sciences*, 14(1), 15-22. doi: [10.22179/REVMACN.14.207](https://doi.org/10.22179/REVMACN.14.207).
- [12] Islam, M., Kuddus, M.R., Rashid, M.A., & Haque, M.R. (2020). Phytochemical investigations of *Campsis radicans* L. *Journal of Applied Pharmaceutical Research*, 8(3), 55-59. doi: [10.18231/j.joapr.2020.v.8.i.3.55.59](https://doi.org/10.18231/j.joapr.2020.v.8.i.3.55.59).
- [13] Jiang-bao, X., Shu-Yong, Z., Guang-Can, Z., Wen-Jun, X., & Zhao-Hua, L. (2011). Critical responses of photosynthetic efficiency in *Campsis radicans* (L.) Seem to soil water and light intensities. *African Journal of Biotechnology*, 10(77), 17748-17754. doi: [10.5897/AJB11.2208](https://doi.org/10.5897/AJB11.2208).
- [14] Karaduman Yesildal, T., & Soyulkan, C. (2024). Bioactive compounds from *Campsis radicans* L.: Antioxidant and antiproliferative effects on colon cancer cells. *Preprints*. doi: [10.20944/preprints202402.0930.v1](https://doi.org/10.20944/preprints202402.0930.v1).

- [15] Killi, K.U., Malík, M., Navratilova, Z., Patočka, R., Oleksak, P., Killi, S., Kuca, K., Tlustoš, P., & Patočka, J. (2024). Exploring the biomedical applications of *Campsis radicans* (woody vine): Integrating traditional wisdom and contemporary insights. *Phytochemistry Reviews*. doi: [10.1007/s11101-024-10018-0](https://doi.org/10.1007/s11101-024-10018-0).
- [16] Lady Bird Johnson Wildflower Center. (2024). *Plant Database*. Retrieved from [https://www.wildflower.org/plants/result.php?id\\_plant=cara2](https://www.wildflower.org/plants/result.php?id_plant=cara2).
- [17] Maurer, V.M., & Kushnir, A.I. (2008). *Methodical recommendations for the propagation of woody ornamental plants of the Botanical Garden of the NUBiP, Ukraine*. Kyiv: NUBiP Ukraine.
- [18] Mokni, R.E., & Iamonico, D. (2024). The family Bignoniaceae in Tunisia, first survey including new floristic records to North Africa with nomenclatural notes. *Hacquetia*, 23(2), 221-237. doi: [10.2478/hacq-2024-0001](https://doi.org/10.2478/hacq-2024-0001).
- [19] POWO (Plants of the Word Online). (2025). *Campsis radicans* (L.) Bureau. Retrieved from <https://powo.science.kew.org/taxon/urn:lsid:ipni.org:names:30332621-2>.
- [20] Raab-Straube, E. von, & Raus, T. (Eds.). (2019). Euro+Med-Checklist Notes, 11: Notes relating to the Euro-Mediterranean flora No. 40. *Willdenowia*, 49(3), 421-445. doi: [10.3372/wi.49.49312](https://doi.org/10.3372/wi.49.49312).
- [21] Rajput, K.S., Gondaliya, A.D., Lekhak, M.M., & Shrirang R.Y. (2018). Structure and Ontogeny of Intraxylary Secondary Xylem and Phloem Development by the Internal Vascular Cambium in *Campsis radicans* (L.) Seem. (Bignoniaceae). *Journal of Plant Growth Regulation*, 37, 755-767. doi: [10.1007/s00344-017-9771-x](https://doi.org/10.1007/s00344-017-9771-x).
- [22] Ramtin, M., Sharifniya, F., Larypoor, M., Mirpour, M., & Zarrabi, S. (2022). Evaluation of the active ingredient of campsis radicans essential oils and its antimicrobial evaluation against pathogenic bacteria. *Current Microbiology*, 79, article number 338. doi: [10.1007/s00284-022-03042-w](https://doi.org/10.1007/s00284-022-03042-w).
- [23] Raulston, J.C., & Grant, G. (1994). Trumpetvines (*Campsis*) for landscape use. In *Proceeding southern nursery association researchers conference* (pp. 359-363).
- [24] Shlapak, V.P., Mamchur, V.V., Koval, S.A., Ischuk, G.P., & Kurka S.S. (2019). Complex assessment of *Ailanthus altissima* (Mill.) introduction, accumulation and decorativity in the conditions of the Right-belt forest-steppe and steppe of Ukraine. *Scientific Bulletin of UNFU*, 29(6), 14-17. doi: [10.15421/40290602](https://doi.org/10.15421/40290602).
- [25] Tufail, S., Ali, Z., Hanif, S., Sajjad, A., & Zia, M. (2022). Synthesis and morphological & biological characterization of *Campsis radicans* and *Cascabela thevetia* petals derived silver nanoparticles. *Biochemical Systematics and Ecology*, 105, article number 104526 doi: [10.1016/j.bse.2022.104526](https://doi.org/10.1016/j.bse.2022.104526).
- [26] Wennerberg, S. (2004). *Trumpet creeper Campsis radicans* (L.) Seem. ex Bureau. Retrieved from [https://plants.usda.gov/DocumentLibrary/plantguide/pdf/pg\\_cara2.pdf](https://plants.usda.gov/DocumentLibrary/plantguide/pdf/pg_cara2.pdf).
- [27] Zou, T.-T., Wang, Ch.-H., Lyu, S.-T., Yu, X., Deng, L.-X., Liu, W.-Q., Dai, J., & Wang, X.-F. (2022). Effects of heterospecific pollen on stigma behavior in *Campsis radicans*: Causes and consequences. *American Journal of Botany*, 109(6), 1004-1015. doi: [10.1002/ajb2.1865](https://doi.org/10.1002/ajb2.1865).

## Особливості росту та генеративного розвитку *Campsis radicans* (L.) Seem. ex Vigueau в умовах Північного Причорномор'я

**Ольга Корольова**

Кандидат біологічних наук, доцент

Чорноморський національний університет імені Петра Могили

54000, вул. 68 Десантників, 10, м. Миколаїв, Україна

Миколаївський національний аграрний університет

54008, вул. Георгія Гонгадзе, 9, м. Миколаїв, Україна

<https://orcid.org/0000-0003-0429-1135>

**Анотація.** Необхідність контролю поширення інтродукованих видів із високим адаптивним потенціалом у нових екологічних умовах зумовлює потребу у вивченні їх біологічних властивостей. Мета дослідження полягала у встановленні біологічних особливостей рослин *Campsis radicans* (L.) Seem. ex Vigueau в умовах Північного Причорномор'я з можливістю визначення потенційної здатності натуралізуватися. Матеріалом дослідження стали збори плодів і насіння *C. radicans*, а також спостереження за 40 різновіковими особинами *C. radicans*, виконані протягом 2023-2025 рр. У результаті досліджень було встановлено, що у своєму розвитку особини *C. radicans* проходять 3 онтогенетичні періоди та 7 вікових станів. Вегетаційний період *C. radicans* на дослідженій території триває 240 днів. *C. radicans* характеризується пізнім початком та закінченням вегетації і відноситься до весняно-літньо-осінньозелених рослин. З'ясовано, що карпологічні ознаки *C. radicans* узгоджуються із видовою нормою. Плоди *C. radicans* мали довжину 8-20 см (14,3 см в середньому) та ширину 2,0-3,3 см (2,5 см в середньому). Лінійні параметри насінини склали 0,4-0,8 см завдовжки (0,5 см в середньому) та 0,6-0,9 см завширшки (0,8 см в середньому). Показник маси 1000 насінин дорівнює 3,4 г. Визначено, що досліджені рослини утворювали якісний посівний матеріал. Показники схожості та енергії проростання насіння в лабораторних умовах були вищими, ніж у польових умовах (94 та 90 %, 86 % та 77 % відповідно). Розраховане за 4 критеріями акліматизаційне число дорівнює 90 балам, що відповідає повному ступеню акліматизації *C. radicans* на території Північного Причорномор'я. Виявлені особливості росту та генеративного розвитку *C. radicans* вказують на значні пристосувальні можливості виду

**Ключові слова:** *Campsis radicans*; онтогенез; посівні якості насіння; ступінь акліматизації; насіннєве поновлення