

Abstract

Dioecious species are present in many different systematic groups and various environments. In addition to the specific system of reproduction, secondary sexual dimorphism is commonly observed for those species. The following research hypotheses were put forward in the studies: 1) dioecious plants show differences between sexes connected with occurrence of mechanisms, which enable females to compensate the greater reproductive effort; 2) in dioecious species differences between sexes occur in strategies and intensity of response to stress conditions; 3) male and female of dioecious species show sexual dimorphism in strategies of resource allocation and storage in leaves.

The studies were conducted on two dioecious, evergreen woody species. The ranges of those species do not overlap and they occur in different parts of the world. The first of them, *Juniperus communis* L. commonly occurs in the northern hemisphere, while the second, *Adriana tomentosa* Gaudich. is endemic to Australian continent.

The research approach to these plants varied from species to species. *J. communis* individuals grew in a pot experiment, where they were divided on two groups differing in access to soil resources: fertilized and non-fertilized group. Measurements were conducted for two years, four times per year, during each season on needles, which had grown in the previous year. The concentrations of carbohydrates, phenolic compounds and basic elements like carbon, nitrogen and phosphorus were measured. Besides of that measurements were conducted using a fluorimeter. They helped to calculate basic parameters connected with photosynthetic efficiency. Moreover, there were determined photosynthetic pigments concentrations, absorption, leaf mass per area ratio, antioxidant enzymes activity and reactive oxygen species concentration.

Individuals of *A. tomentosa* were studied in two natural populations differing in environmental conditions. Leaves collected for analyses (separately for each sex) were divided on current and last year leaves. There were determined their area and shape, the concentration of water, elements (C and N), stable isotopes composition and photosynthetic pigments concentration, specific leaf area (SLA) and the degree of lamina damages.

As the result of the studies, occurrence of secondary sexual dimorphism was confirmed in both species. It contained both constitutive traits as well as the response to environmental conditions, including stress conditions. There was not observed any mechanism of compensation of greater female reproductive effort in *J. communis*, observed as increasing photosynthetic efficiency or concentration of photosynthetic pigments. Moreover,

leaf area in *A. tomentosa* was smaller in female individuals. However, it does not have to mean lower level of gas exchange; especially taking into account greater leaf blade irregularity of females compared to males.

Variability of reactive oxygen species concentration, antioxidant enzyme activities, carotenoids and phenolic compounds concentrations is connected with plants response to stress. Differences in values of those parameters between male and female individuals of *J. communis* were observed. However, they appeared independently of fertilization conditions. In the case of phenolic compounds intersexual variability was particularly visible during autumn and winter, most probably as the response to low- temperature stress. Whereas, in *A. tomentosa* intersexual differences in lamina damage were dependent on population. It indicates on possible sexual dimorphism in strategies of defense against stress conditions; abiotic as well as biotic. However, intersexual differences in this case are highly dependent on environmental conditions, including possible changes connected with plants phenology.

Intersexual variability in resource allocation was also observed. Female individuals of *J. communis* had higher carbohydrates and carbon concentrations in needles than male individuals and it was independent of resource availability. Additionally, male individuals were characterized by higher concentration of some of the macroelements in needles, which may be connected with allocation of those elements to generative structures by female individuals. In case of both species studied male individuals had higher nitrogen concentration. It is commonly observed phenomenon in dioecious plants and it indicates occurrence of universal resource allocation schemes.

The results of these studies indicates that intersexual variability occurs in both species and can be observed as secondary sexual dimorphism connected with morphological and physiological features. Analyzed differences are related to greater reproductive effort compensation mechanisms, response to environmental stresses and resources allocation. Variability of some parameters showed similar pattern of intersexual differentiation for both analyzed species (for example nitrogen concentration). Some of the differences between genders were also dependent on factors like phenological phase and the fertility of the habitat.