EFFECT OF THE CUTTING DATE ON BLOOMING AND FRUIT-BEARING OF OSTERICUM PALUSTRE BEESSER

Ewa Krasicka-Korczyńska

Department of Botany and Ecology, Faculty of Agriculture
University of Technology and Life Sciences in Bydgoszcz, S. Kaliskiego 7, 85-796 Bydgoszcz, Poland

e-mail: kra-kor@utp.edu.pl

Received: 22.10.2007

INTRODUCTION

O. palustre is a rhizome perennial (hemicriptophyte) of Apiaceae family, from 0.4 m to 1.4 m high. The inflorescence is an umbel made up of 8-30 umbellules. It blooms June through September. It reproduces generatively (Rutkowski, 2004). It is a Eurasian and continental species, in Poland – reaching the western limit (Meusel et al. 1978).

In Poland it is mostly found in Małopolska, Podlasie, Mazowsze, Kujawy and Wielkopolska (Zając and Zając, 2001; Bróz et al. 2002; Zaluski, 2004; Stasiewska, and Zaluski, 2004; Bróz and Podgór ska, 2006). The most northern single stands were recorded in Kaszuby (Markowski and Buliński, 2004).

O. palustre occurs in the habitats of moorgrass meadows of variable moisture content, alkaline peatland and fresh extensively-used meadows. In Poland, since 2001 it has enjoyed the status of a species protected by law (Dz. U. No 168). Earlier, as an endangered species, it was listed in the Polish Red Data Book of Plants (Czarna and Zaluski, 2002). In the Kujawy and Pomorze region, it is a species endangered with extinction (V) (Rutkowski 1997). It is found on the list of species which require protection by the designation of Natura 2000 areas (Dz. U. No 94). The main threats for this species include changes in the habitat caused by drying of the areas of river valleys and a change in traditional meadow management practices.

In 2004, in Poland agro-environmental programmes were introduced to protect the biodiversity in agricultural areas (Dz. U. No 174). The programme packages for different meadow types differ mainly in cutting dates to enhance the preservation of the population of birds and meadow plant species. In the PO1b package, the first cutting can be made starting from July 1. Cutting of meadows with O. palustre can considerably affect the possibility of annual
fruit-bearing of this species, which is important to maintain the population size. It appears that seeds of many species survive for 3-5 years, and the biggest number of seeds germinates in the first year (Falińska, 1990). It seems, therefore, necessary to define such a meadow cutting date which would allow an annual production of generative diasporas, especially in the case of rare species (Baskin and Baskin, 1985a, b).

The aim of the present research was to determine the effect of the cutting date on blooming and fruit-bearing of *O. palustre* in meadows covered by the PO1b agro-environmental programme.

**MATERIALS AND METHODS**

The research was performed in fresh moist meadows, double-cut, located at Minikowo and Białe Blosta, in the microregion of the Bydgoszcz Canal Valley, which is part of the Toruńska Valley mesoregion (Kondracki, 2000).

*Magnocaricion* association phytocenoses dominate here and the biggest patches are made up by the *Carex nigra* community as well as *Caricetum acutiflorum*, *Caricetum gracilis* and *Caricetum distichae* (Krasicka-Korczyńska, 2007). *O. palustre* occurs almost in all the phytocenoses found, most abundantly in

![Fig. 1. Phenological spectrum of *Ostericum palustre* in area 2.](image1)

![Fig. 2. Phenological spectrum of *Ostericum palustre* in area 2.](image2)
Effect of the cutting date on blooming and fruit-bearing of *Ostericum palustre* Beesser

**Fig. 3.** Phenological spectrum of *Ostericum palustre* in area 2.

**Fig. 4.** Phenological spectrum of *Ostericum palustre* in area 1.

communities with: *Carex nigra*, *C. gracilis*, *C. acutiformis* and *Poa pratensis-Festuca rubra*. The populations of *O. palustre* covered by phenological examinations occur in *Carex nigra* patches.

Observations were made in 2007, two years after the implementation of the agro-environmental programme. For the purpose of the present research, there were selected patches of three populations of *Ostericum palustre* located at:

1. Minikowo – meadow outside the programme (2),
2. Minikowo – meadow covered by the PO1b programme (1),

The phenological observations were made for each patch using 30 randomly sampled individuals. Their beginning was defined by the date of fruit-bearing of the oldest inflorescence of the agriculturally unused meadow at Biało Błota. During the observations, the following development stages of successive umbel layers were observed: inflorescences in buds, flowers in buds, beginning of blooming (30% of flowers blooming), full bloom (75% of flowers blooming), end of blooming (10% of flowers blooming), young fruit, ripe fruit, shedding, shed fruit, dried inflorescence. In the respective layers of each individual, the number of umbels was recorded at the respective stages. Mean umbel numbers
and standard deviations of these means were calculated. In the patches 0 and 2, four observations were made in each, and in the patch 1 three, as after the last observation the meadow was cut.

RESULTS

Individuals of *O. palustre* on the traditionally used meadows (2), prior to the first cut, reach the phase of leaf rosette most often made up of 3 fully-developed leaves which are lost by the plant with meadow sward cutting. Only after the first cut do the individuals of *O. palustre* develop most often a single generative tiller. After about one month the plants bloom. Full bloom of the lowest inflorescence occurs after July 20. Three levels of inflorescences develop on the plants. The first level always produces only a single umbel, on the second one – an average of $3.88 \pm 1.24$, and on the third one – an average of $4.71 \pm 2.05$ umbels. In a few strongest individuals, the fourth inflorescence layer occurs.

The first ripe fruits occur on the lowest inflorescence about mid August and already at the end of August, right before the second cut, over 90% of fruits reach full ripeness (Fig. 1). In the second layer of umbels,
young fruits are found in about 50% of the individuals in mid August, while prior to the second cut – in about 90%, however none of them manages to reach full ripeness before the cut (Fig. 2). On the same dates, in the third layer of umbels most flowers bloom. Prior to cutting, about 50% of flowers come out of bloom (Fig. 3).

In the meadows covered by the PO1b agro-agricultural programme, the first cut was made on July 10. At that time, about 90% of the individuals of O. palustre developed a generative tiller. A few of them started to bloom. After cutting and another development from lateral buds of generative tillers, they reached the period of full bloom in the first week of August. By mid September the plants also managed to develop three inflorescence layers; the first one, as usual single umbels, the second layer – an average of 4.28 ± 1.59 umbels, and the third one – an average of 4 ± 2.00. The fourth layer of umbels was not observed. In mid August in about 40% of the individuals young fruits were observed on the first inflorescence, and at the end of August – already in about 70%. Fully ripe fruits on the first inflorescence were observed in about 80% of the individuals on September 12 (Fig. 4). In the second inflorescence layer, in mid August full bloom was noted. In mid September about 30% of flowers in the second umbel layer were in full bloom (Fig. 5), while in the third layer 10% of the
umbels bloomed (Fig. 6). At the same time, as a result of cold nights, flower withering was observed in the second and third umbel layers, which made fruit-setting impossible.

All the phenological stages first occurred in the meadow at Biało Błota undisturbed with agrotechnical treatments; in the first layer – a big single umbel, in the second one – an average of 7.64 ±1.32 umbels, and in the third one – 18.96 ± 6.26, while in the fourth one – 18.10 ± 11.03. The fifth layer developed only in a few individuals. Ripening of the first to the last inflorescence there took 14 days. The plants produced five inflorescence layers.

Full bloom of $O.\ palustre$ individuals occurs after July 20. On the first date of phenological observation, August 6, in 76.6% of individuals ripe fruits were noted in the first inflorescence and already on August 27 all the fruits of these inflorescences were ripe. By mid September they shed off completely (Fig. 7). In these individuals, also all the fruits were ripe in the second inflorescence layer. Most are ripe already at the end of August, but complete shedding of inflorescences from the pedicle takes until mid September (Fig. 8). Full bloom of the third inflorescence layer occurs at the end of August. More than 50% of fruits set from these flowers ripen about mid September, but almost 30% wither as a result of cold humid nights at that time of the year (Fig. 9). For the same reasons, flowers developed in the fourth and fifth inflorescence layer did not produce ripe fruits.

**DISCUSSION**

For a species to survive in a given habitat, the capacity for regular production of ripe diasporas (Fałosińska, 2004) is crucial, which in turn can affect maintaining the biodiversity.

The first cut of the meadow sward, depending on the habitat and the weather pattern, occurs at the end of May. At that time most plant species are at the vegetative phase. After the cut, they reproduce the overground part and produce generative tillers, e.g. *Heracleum sibiricum*, *Angelica sylvestris* and *Lythrum salicaria*, which allows them to get rid of the cohort of generative diasporas. A similar reaction is recorded for $O.\ palustre$ which, right after the first cut, produces a generative stem on which, before the second cut, fruits of the first umbel ripe. They are the only ripe fruits which guarantee the supply of diasporas to the seed bank found in these individuals.

A delayed cutting in the meadows covered by the agro-environmental programme PO1 b disturbs the plant growth at the time when most of them bloom and bear fruit. $O.\ palustre$ individuals at the beginning of July have a fully-developed generative stem and some of them start blooming. Cutting results in a loss of almost the entire overground part, including the inflorescence. After cutting the overground part regrows from lateral buds growing from the rhizome, however it does not reach such an amount as the weight of individuals not exposed to such pressure, as reported by Czartocka (1995). It affects the number of inflorescences and flowers per inflorescence. The date of blooming and fruit-bearing is delayed almost one month. Probably also the weight of seeds produced decreases. A similar phenomenon was observed by Gęsiński (1998) and Stosik (2006 a, b) in *Plantago lanceolata* and *Rumex confertus*.

Even though meadow habitats are grown with species which have adapted themselves to disturbances as a result of meadows being used for hay, which periodically eliminates competitors and enhances the supply of new individuals to the population, e.g. in *Rumex con-
Effect of the cutting date on blooming and fruit-bearing of Ostericum palustre Beessner

REFERENCES


Decree of the Minister of the Environment of May 16, 2005 on the types of plant and animal habitats which require protection by the designation of Natura 2000 areas (Dz. U. No 94, item 795 of May 16, 2005).

Decree of the Minister of the Environment of July 9, 2004 on protected wild plant species (Dz. U. No 168, item 1764, of 09-07-2004, Attachment 3).

Decree of the Council of Ministers of July 20, 2004 on detailed conditions of financial assistance to support agro-environmental projects and enhancement of animal welfare covered by the rural areas development plan (Dz.U. No 174, item 1809 of July 20, 2004).


Wpływ terminu koszenia na kwitnienie i owocowanie *Ostericum palustre* Beesser

**Streszczenie**

Na łąkach wilgotnych, turzycowych, użytkowanych dwukosowo, położonych w Dolinie Kanalu Bydgoskiego występuje *O. palustre*, gatunek o znaczeniu priorytetowym, wymagający ochrony w formie wyznaczenia obszarów Natura 2000. Zagadnienia owocowania są podstawowym warunkiem zachowania populacji tego gatunku. Celem badań było określenie wpływu terminu koszenia na kwitnienie i owocowanie *O. palustre*, na łąkach objętych programem rolnośrodowiskowym PO1b, mającym wspierać zachowanie różnorodności biologicznej. Do obserwacji fenologicznych wybrano trzy populacje. Pierwsza z nich występuje na łące użytkowanej tradycyjnie, nie objętej programem rolnośrodowiskowym (2), gdzie termin I pokosu przypada na połowie lipca. Druga położona jest na łące objętej programem rolnośrodowiskowym (1), gdzie termin I pokosu możliwy jest od 1 lipca i trzecia populacja zlokalizowana na łące naturalnej, nie użytkowanej rolniczo (0).

W wyniku przeprowadzonych badań okazało się, że osobniki *O. palustre* na łąkach użytkowanych tradycyjnie (2), przed I pokosem osiągają fazę rozetliściowej. Tracą ją w trakcie pierwszego pokosu, po czym wydają pęd generatywny, który około 20 lipca jest w pełni kwitnienia, a w końcu sierpnia, tuż przed II pokosem, rośliny wydają dojrzałe owoce na pierwszym kwiatostanie.

Osobniki *O. palustre* występujące na łące objętej programem rolnośrodowiskowym (1), przed I pokosem osiągają fazę pędu generatywnego, który tracą w czasie koszenia. Reakcją obronną gatunku jest wytworzenie 2 do 3 nowych pędów generatywnych z pączków przybyszowych kląta. Pełnia kwitnienia na tych pędach przypada dopiero na początku sierpnia, a owoce pierwszego kwiatostanu osiągają pełną dojrzewłość w połowie września, pod warunkiem, że wcześniej nie zostaną skoszone w ramach II pokosu. Na obydwu użytkowanych rolniczo łąkach nie dojrzewają owoce dalszych pięter kwiatostanów.

W tym samym czasie, około 6 sierpnia, I kwiatostan osobników występujących na łące nie użytkowanej rolniczo (0), w 70% ma dojrzałe owoce, a w połowie sierpnia dojrzewają już wszystkie. Do końca sierpnia dojrzewają owoce drugiego poziomu kwiatostanów, a do połowy września dojrzewają owoce trzeciego poziomu kwiatostanów.

Poddumowując, opóźnione od 1 lipca koszenie łąk objętych programem rolnośrodowiskowym PO1b, nie sprzyja wydaniu dojrzałych owoców u osobników *O. palustre*. 