

2. ABSTRACT

This paper presents embryological studies of two grass species *Poa nemoralis* L. and *Poa pratensis* L., with special emphasis on processes related to the apomictic mode of reproduction.

Studied individuals were collected from natural populations in the village of Łazy, located in the district of Cracow in the Lesser Poland Voivodeship. Embryological observations of the ovules and anthers were carried out using a microscope fitted with Nomarski contrast (DIC), a fluorescence microscope, a transmission electron microscope (TEM) and a scanning electron microscope (SEM). Embryological studies were complemented by flow cytometric seed analyses.

Embryological observations have shown that in the investigated individuals of *P. nemoralis* and *P. pratensis* facultative apomixis prevailed.

In *P. nemoralis* mitotic diplospory of *Antennaria* type occurs. The transformation processes of the archesporial cell into the megaspore mother cell of diplosporous embryo sac, were characterized by an increase of the cell size as well as structural and functional reorganization of the protoplast, which evidenced high metabolic activities confirmed by observations in TEM.

Observations of the *P. pratensis* ovules showed that only in some ovules the archesporial cell passed a typical meiotic division, a tetrad was created and the development of the chalazal megaspore led to the formation of a reduced embryo sac of the *Polygonum* type. In most of the ovules aposporic initials differentiated in the chalazal part of the nucellus. Observations in TEM have shown that during differentiation, metabolic activity of aposporic initials increased, which supported their independent path of development into embryo sacs. Both the number of initials and the stage of their differentiation varied between certain ovules. Aposporic initials were

noticed in all of the ovules which contained a degenerated tetrad. They were also observed in a statistically significant number of the ovules including megaspore mother cell and almost half of the ovules in which functional megaspore was visible. On the other hand, aposporic initials were found in a statistically low number of ovules in which meiotic division or one- and two-nucleate embryo sacs were observed.

Basing on the observations of the older ovules, it has been stated that in the majority of *P. nemoralis* and *P. pratensis* embryo sacs the egg cell developed parthenogenetically but fertilisation was necessary for the formation of the endosperm (pseudogamy). Only in a few embryo sacs double fertilisation occurred.

Ultrastructural studies of chosen cells of the female reproductive pathway allowed for the observation of specific structural and functional features of the cells involved in amphimitic and apomictic development.

Flow cytometric seed analyses from randomly chosen individuals of *P. nemoralis* and *P. pratensis* have confirmed that most of the plants were facultative pseudogamous apomicts.

Embryological analysis of the anthers showed that in both studied specimen, *P. nemoralis* and *P. pratensis*, the processes of microsporogenesis and male gametophyte development occurred without disturbances and led to the creation of tree-celled mature pollen grains.

Keywords: *Poa nemoralis* L.; *Poa pratensis* L.; apomixis; apospory; diplospory; microsporogenesis; male gametophyte; flow cytometric seed screen; DIC microscopy; TEM; SEM.

