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Variability of *Rhinanthus serotinus* (Schönh.) Oborny in relation to the environment

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SUMMARY

Rhinanthus serotinus (Schönh.) Oborny is an annual hemiparasite occurring in Eurasia in various habitats such as grasslands, dunes, and road verges. This paper reports a study of the pattern of intraspecific variation and its relation to the habitat, mainly carried out in the northern Netherlands.

Wettstein (1899) and Sterneck (1901) both used the theory of seasonal dimorphism as a basis when classifying and interpreting the intraspecific variation, and have been much criticised. The more detailed descriptions by Zinger (1922), a Russian author, are hardly known in the W. European literature. In the recent literature a variety of classifications are presented (I).

Cultivation experiments confirmed the genetic basis of the variation. Several characters, which vary clinally, are correlated: flowering time, node number, leaf index, size of generative parts, length, number of branches. Further variation concerns the growth habit (III.2).

Ecotypes from various habitats could be distinguished, although intermediates are common; five were studied in more detail (III.1; III.3.3a):

– Aestivals: early flowering, mean node number under 9, few branches; in moderately exploited grasslands, mown in June, and grazed or mown later in the year; seed production before hay-making.

– Drente autumnals: intermediate to late flowering, mean node number over 11, several branches; in irregularly disturbed habitats such as road verges and along ditches, often rather poor edaphic conditions.

– Doornspijk autumnals: late flowering, many branches, small generative parts, dark red colour in upper parts of plants; along ditches and edge of reed vegetation; grassland area of N. Veluwe.

– Meppel autumnals: intermediate flowering time, short lower internodes, and extending branches; in grasslands mown twice, seed production between first and second mowing; in Meppel area only.

– Dune ecotype: morphologically intermediate between aestivals and autumnals; in sheltered habitats in inner dunes of "Duin district".

The ecotypes studied and the total Dutch herbarium material can be reckoned to belong to three subspecies described in the literature (III.3.3b).

The species occurs in grasslands or in habitats with many characteristic grassland species; almost all sites are disturbed at more or less regular intervals. It occurs neither in a dense vegetation, nor on very poor and dry soils, nor in marshy habitats, where flooding induces dormancy of seeds and mortality (III.3.2.).

The differentiation of the grassland ecotypes is primarily related to mowing and grazing regime. Aestivals are adapted to it because they produce seed before hay-making, whilst Meppel autumnals have a good seed capacity due to their particular growth habit. All other ecotypes are adapted to sites which are less intensively exploited (IV.1).

Other environmental factors interact with the effects of the mowing regime, moreover they differentiate between the non-grassland ecotypes. Little is known yet, particularly about the role of the host plant. No definite conclusions about ecotypic differentiation due to the environmental factors s.s." (IV.2).

A main morphological factor appears to be node number, which is highly correlated with number of branches and hence seed production. Despite the different seed output per individual plant the seed production per unit area is at a similar level in aestival and autumnal populations. Their life cycle strategies differ (IV.4). The aestivals usually form large populations of rather small uniform plants; they are able to complete the life cycle in an extremely short period without having mechanisms which increase the rate of development, except for a slightly earlier germination (IV.3.3a). If sufficient yearly seed production they require more favourable growth conditions than the autumnals (IV.5.2). The autumnal populations are smaller, and consist of a heterogeneous set of plants in a heterogeneous habitat where a few large individuals compensate for the lower seed production of the smaller individuals.

The number of populations is declining nowadays, due to the fragmentation of the habitat. Mechanical damage, which prevents seed production, and possibly disturbance of the genetic balance are involved (IV.5.1). This is not counteracted by immigration since seed transport is restricted by a stock of seeds buried in the soil, as very few seeds survive for more than one year (IV.4.2).