Flowering and seed development of *Torilis nodosa* and *Anthriscus caucalis*.

R.P. Rawnsley[1], P.A. Lane[1], P.H.Brown[1] and T. Groom[2].

[1] School of Agriculture Science, University of Tasmania, GPO Box 252-54, Hobart 7001.
[2] Botanical Resources Australia Pty Ltd. Industrial Drive, Ulverstone, Tasmania 7315.

Abstract

Anthriscus caucalis and *Torilis nodosa* are two newly emerged Apiaceae weeds in pyrethrum. Little information has been reported on the biology of flowering and seed development of these species. *Anthriscus caucalis* and *T. nodosa* were found to bear hermaphrodite flowers only, which were observed to be weakly protandrous. Both species were found to flower primarily in the spring period and were capable of producing a large number of seeds (> 2000 seeds plant^{-1}). *Anthriscus caucalis* flowered predominantly earlier than *T. nodosa* and maturity and dispersal of seeds occurred between 10-12 weeks after flowering. In comparison *T. nodosa* seeds matured at a slightly slower rate, with seed maturity occurring at approximately 16 weeks after flowering. Seeds of *T. nodosa* were not dispersed freely following maturity and often remained attached in a compact inflorescence.

Key words

Apiaceae, weeds, floral morphology, seed maturity.

Introduction

Anthriscus caucalis M. Bieb. (Burr Chervil) and *Torilis nodosa* (L.) Gaertn. (Knotted Hedge Parsley) are two newly emerged Apiaceae weeds in pyrethrum (*Tanacetum cinerariaefolium* L.). Both are a major concern to the industry as a result of lost productivity and cost of control. Members of the family Apiaceae exhibit diverse breeding systems ranging from completely selfed to obligately out-crossed (1). Little information is available regarding the floral morphology and the growth and development of *A. caucalis* and *T. nodosa*. This information is of critical importance in relation to the timing of harvesting pyrethrum, reducing seed spread, and improving the timing of herbicides for weed control. The aim of this study was to investigate the floral morphology and seed development of *A. caucalis* and *T. nodosa*.

Methods

To assess floral morphology a total of 12 plants of each species were grown in 15 cm pots under glasshouse conditions in a standard potting mix. Following the onset of flowering, plants of each species were destructively harvested over time such that each umbel order was examined in detail. A field study was also conducted to assess the growth and development of *A. caucalis* and *T. nodosa*. Eight commercial pyrethrum fields were selected based on geographic distribution and presence of the weed species. At 14-day intervals 20 individual plants were randomly selected and the growth stage assessed. At the commencement of seed development seeds were removed from each umbel position of *A. caucalis* and seed dry weight (DW) percentage was determined. The procedure was repeated for *T. nodosa*, however, due to the compact structure of the inflorescence DW percentage was determined on an umbel basis only. Bulk seed lots were collected for both species and tetrazolium and germination tests were used to assess seed lot viability.

Results

Under glasshouse conditions the mean total number of umbels per plant of *A. caucalis* was 199? 36 which was significantly higher ($P < 0.001$) than *T. nodosa*, 106 ? 13. Both *A. caucalis* and *T. nodosa* produced between 3 to 5 umbellets per umbel order. The mean number of flowers per umbellet of *T. nodosa*, 8.13 ? 0.28, was significantly higher ($P < 0.001$) than for *A. caucalis*, 5.75 ? 0.19. Each umbel order of both *A. caucalis* and T. *nodosa* was observed to bear only hermaphrodite flowers.

Development of the stigmas of both species indicated that the flowers were weakly protandrous, although self-fertilisation did not appear restricted with homogamy of flowers also evident. From the field study it was found that flowering and seed maturity occurred four to six weeks earlier in *A. caucalis* than *T. nodosa* (Figure 1 a and b).

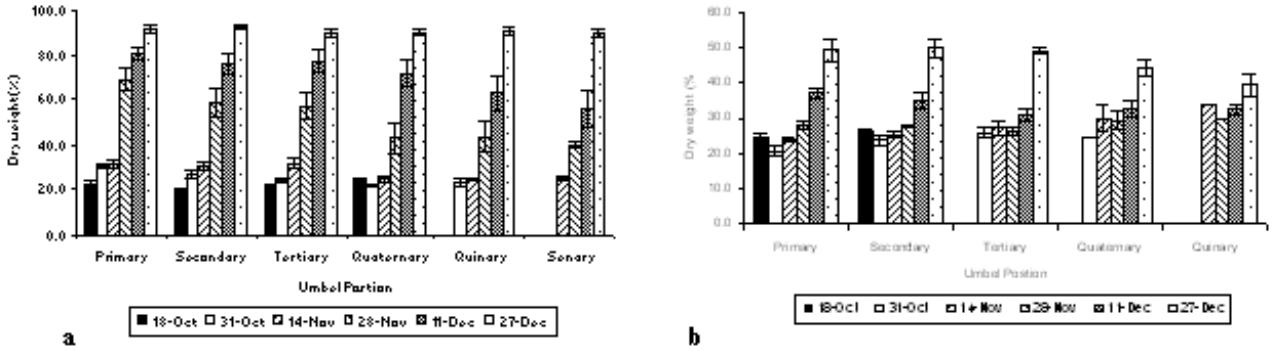

Figure 1a and b. Changes in mean dry weight percentages of *A. caucalis* seeds (a) and *T. nodosa* umbels (b), from each umbel order positions as affected by time. s.e. shown as error bars.

From the field trial it was also found that seeds of *A. caucalis* became viable earlier than seed of *T. nodosa* (Table 1), although seeds of *T. nodosa* reached a higher level of viability.

Table 1. Mean percentage viability of *A. caucalis* and *T. nodosa* seeds as affected by harvest date.

	Harvest date			
Species	14/11/01	28/11/01	11/12/01	27/12/01
A. caucalis	20.3 ? 4.2	58.9 ? 2.7	54.3 ? 2.1	71.2 ? 6.2
T. nodosa	0.0 ? 0.0	0.0 ? 0.0	0.0 ? 0.0	95.3 ? 1.8

It has been observed that the spread and distribution of *A. caucalis* is greater than *T. nodosa* and it is conceivable that a contributing factor is that at the time of pyrethrum harvest, *A. caucalis* seeds have matured and are more easily dispersed from their umbel structure and thus are readily attached and transported *via* harvest machinery. In contrast seeds of *T. nodosa* are not as mature and are not freely dispersed.

Conclusion

Apiaceae weeds *A. caucalis* and *T. nodosa* were shown to have similar floral morphology, with both species bearing hermaphrodite flowers only. Seeds of *A. caucalis* were found to mature predominantly earlier than seeds of *T. nodosa* and maturity coincided with pyrethrum harvest, which has most likely contributed to the distribution and spread of this weed. Understanding the growth and development of these weeds provides valuable information for developing integrated control measures.

References

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