Dispersal biology of *Orobanche ramosa* in South Australia

Master of Science

Thesis

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Appendix 1. Details of sheep body weight and wool testing

Body Weight

Body weight of the sheep was monitored for the purpose of reporting back to the animal ethics committee as an indication of general health. The body weight of the sheep changed marginally over the course of the experiment, but that change was not statistically significant (T = -0.75, *P* = 0.46, *d. f.* = 23) (Figure 6.1). Fifteen sheep gained weight during the experiment, and 9 lost weight. The average initial weight was 41.79 kg, and the average final weight was 42.46 kg, a difference on average of less than one kilogram. The changes in weight of the drenched sheep were not significantly different from the non-drenched sheep (T = -1.25, *P* = 0.23, *d. f.* = 22) (Figure 6.1), indicating that drenching with water and *O. ramosa* seeds did not affect the condition of the sheep.

Wool testing

The wool testing laboratory returned the following results (data are means and SE): length 81.67 ± 2.68 mm, yield 71.67 ± 0.67%, fibre diameter 28.65 ± 0.64 μm.

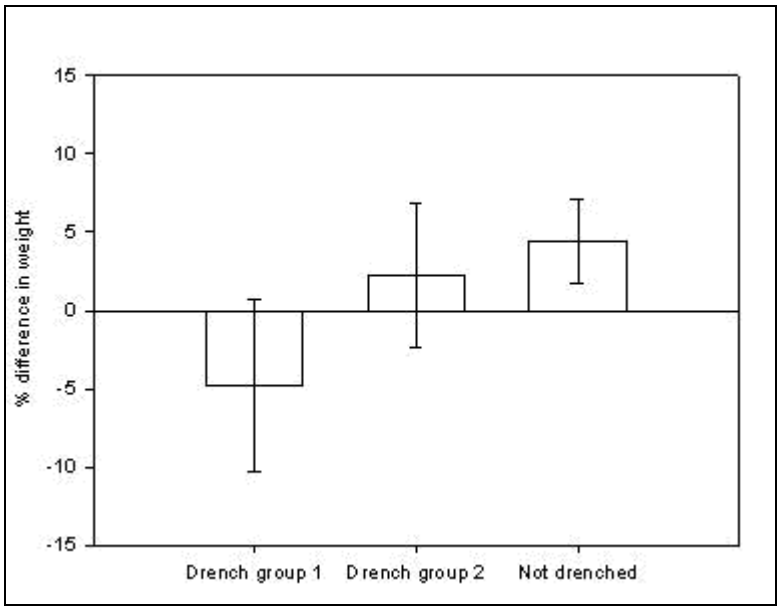

Figure 6.1. Changes in weights of sheep before and after 'gut-passage experiment' (drench group 1 & 2), and all other experimental and back-up sheep (not drenched). Data are means and S.E. Drench group 1 (n = 4) sheep were sampled for 7 days, and drench group 2 (n = 4) sheep which were sampled for 9 days. For not drenched, n = 16 sheep.

Appendix 2. Trial of seed trap design

Methods

Three trap designs were assessed:

Sticky tape line. A continuous line of double-sided sticky tape attached to a 1 x 0.05 m strip of sheet metal. Placed at the base of the plant (sticky side up) extending to 1 m from the plant. To retrieve, single-sided tape was placed over double-sided tape to lock in sample.

Vaseline slides. Glass microscope slides smeared with Vaseline (petroleum jelly) and placed on the ground at 0.25 m intervals, similar to Berner et al. (1994). The slides were placed along four radii at intervals of 0.25 m. Traps were left for 24 h. To retrieve, a clean slide was placed on top of the sample slide and the two were sticky-taped together

Taped slides. Glass microscope slides with 0.07 m strip of double-sided sticky tape placed in the centre. Slides placed on the ground at 0.25 m intervals. Traps were left for 24 h. To retrieve, the sticky surface of each slide was covered with a strip of single-sided tape.

The experiment was set up on an 8 x 8 m plot of low pasture, free of emerged *O. ramosa* plants. Three seed-bearing *O. ramosa* plants were transplanted into the centre of the plot. They were held in place with wire pins (approx 0.1 m long) driven into the ground. The units were set up on six radii around each plant as shown in Figure 7.1.

Results

Seeds were trapped by each of the three trap designs. Seeds were not counted in the sticky tape line because the surface of the metal which the tape was stuck on was too mottled to see seeds under the microscope, though it could be seen that seeds were caught by this method. The results of the Taped slides are shown in Figure 7.2, while the results from the Vaseline slides are in Figure 7.3. In all cases, 90% of seeds in each radii were caught within 0.5 m of the plant. While the total number of seeds caught by each method were slightly higher for Vaseline Slides than Taped Slides, this difference was not statistically significant ($P = 0.2140$, $d.f.=38$).

Scores out of 10 are awarded against 5 criteria: (1) ability to catch seed; (2) cost of unit; (3) ease of deployment; (4) ease of retrieval; and (5) ease of seed counting, as shown in Table 7.1.

Two-thousand and twenty-nine *O. ramosa* seeds were caught over the 24 h, and a distribution curve was produced for each of the radii (Figures 7.2 and 7.3).

Discussion

The distribution curves for the dispersal of seeds by wind approached an exponential decrease in seed number with increasing distance (Figures 7.2 and 7.3). This pattern was shown in both the Taped slides unit and the Vaseline slides unit.

By far the easiest trap unit to use was the Taped slides. The only drawback was if sand was present on the slide it made it difficult to analyse under the microscope as the sand grains were similar in size to the *O. ramosa* seeds, which made analysis more labour-intensive. Vaseline slides were messy to deploy, messy to retrieve and allowed for increased chance of operator error through smudging the Vaseline surface, thereby destroying the sample. The petroleum jelly melted quickly and became liquid in the hot sun, perhaps reducing the chances of the petroleum jelly staying on the surface of the slide. The Sticky tape line was quick to deploy and retrieve but cumbersome to deal with in the laboratory.

A combination of two units, the Taped slides and the Sticky tape line, was created to produce a continuous line of tape that was protected from the soil (like the Sticky tape line) but was still easy to transport and look at under a microscope (a feature of the Taped slides). 19 slides were placed in a 1.5 m aluminium rack wide enough to hold a slide, with 1 cm slides to protect the slides from the soil. A single continuous strip of double sided tape was placed along the centre of all of the slides, secured at each end by sticking the tape to the aluminium. To deploy, racks were placed into position on 8 radii around the plant, and the backing paper from the tape removed. To retrieve, racks were removed from the ground and normal tape placed over the top of the double sided tape. Slides are analysed under a dissecting microscope.

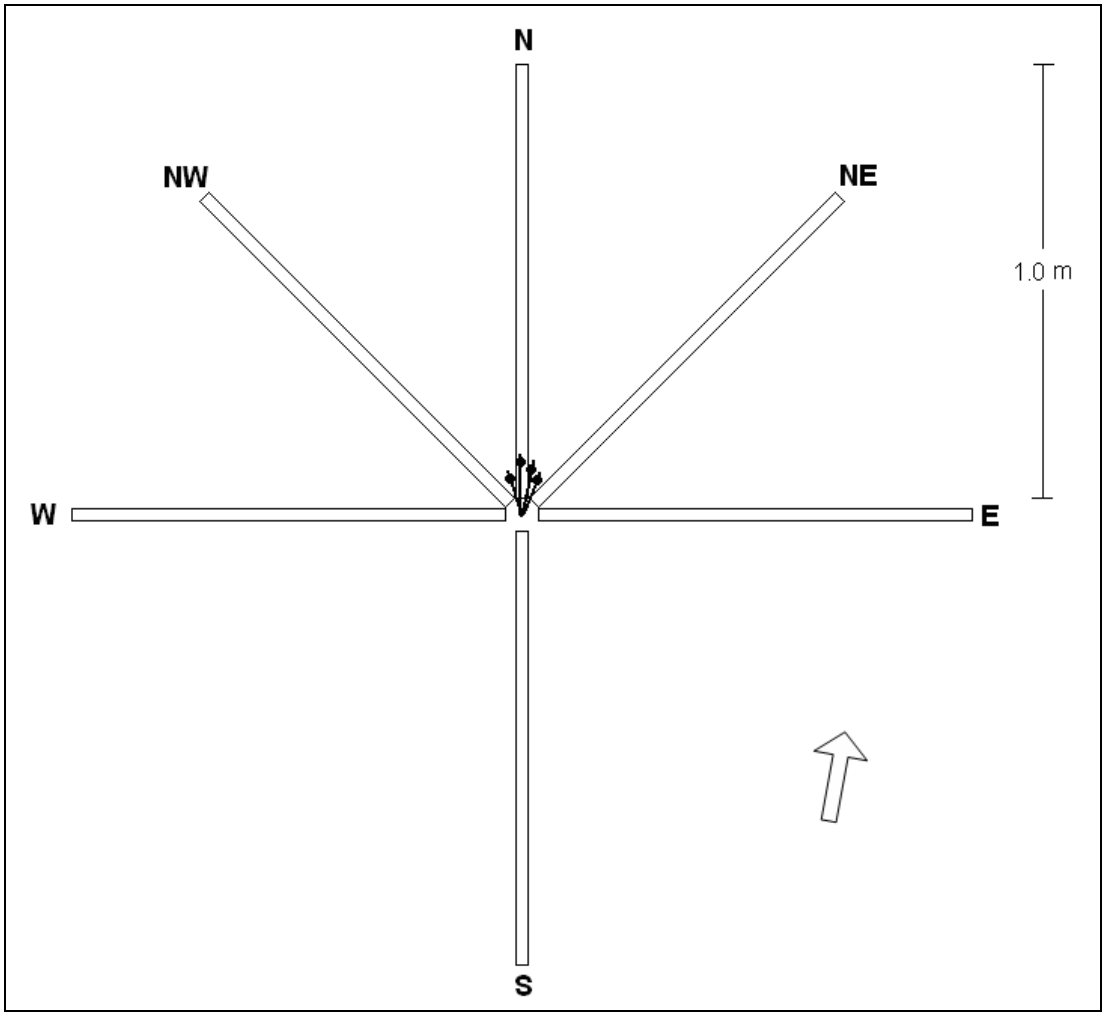

Figure 7.1. Arrangement of radii around plant (circle) for pilot experiment. The arrow indicates the direction of the prevailing wind at the time of deployment.

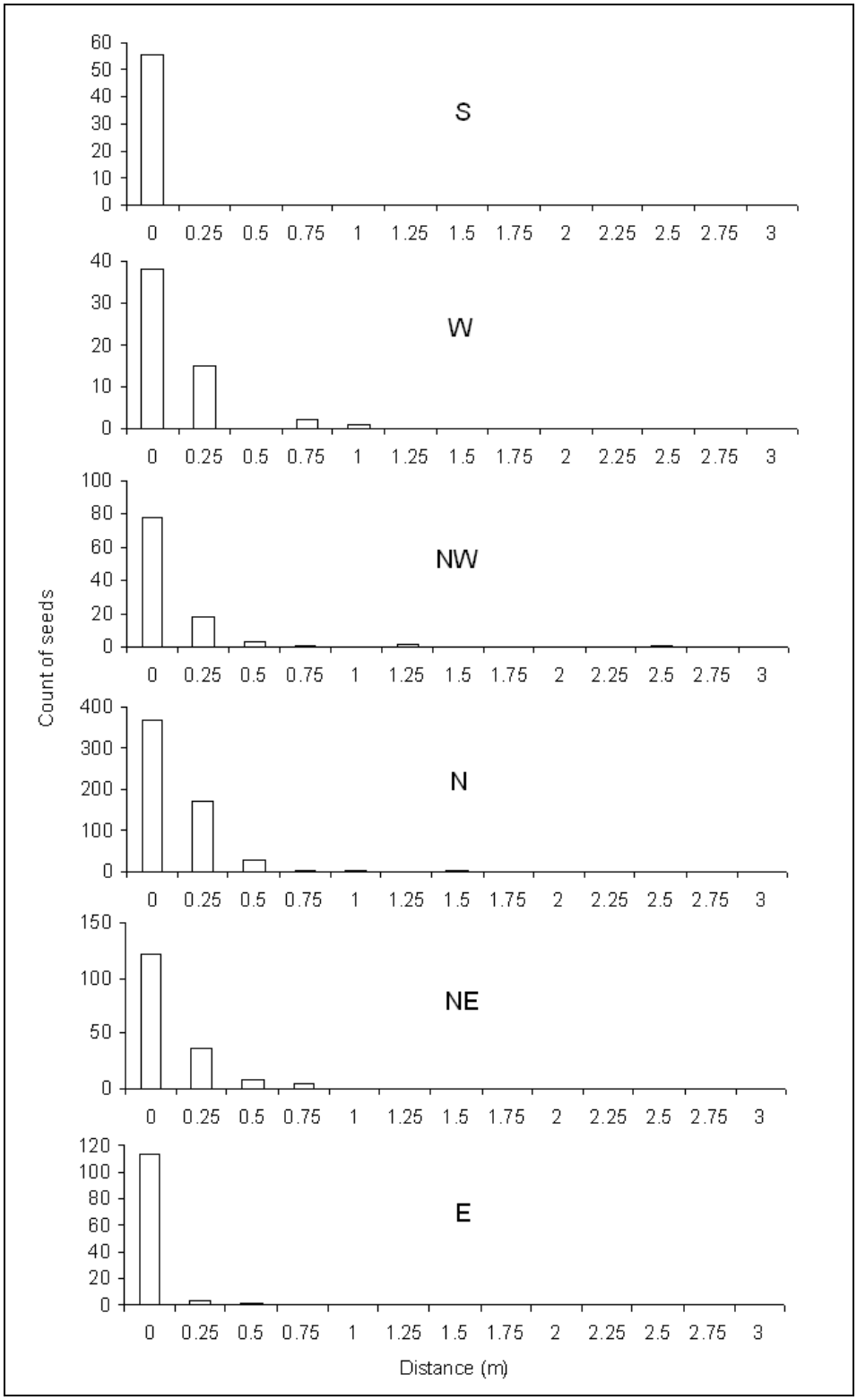

Figure 7.2. Results of 'Taped Slides' pilot wind dispersal experiment. Radii are as shown in Figure 1. Note the scale on the y axis changes for each radii.

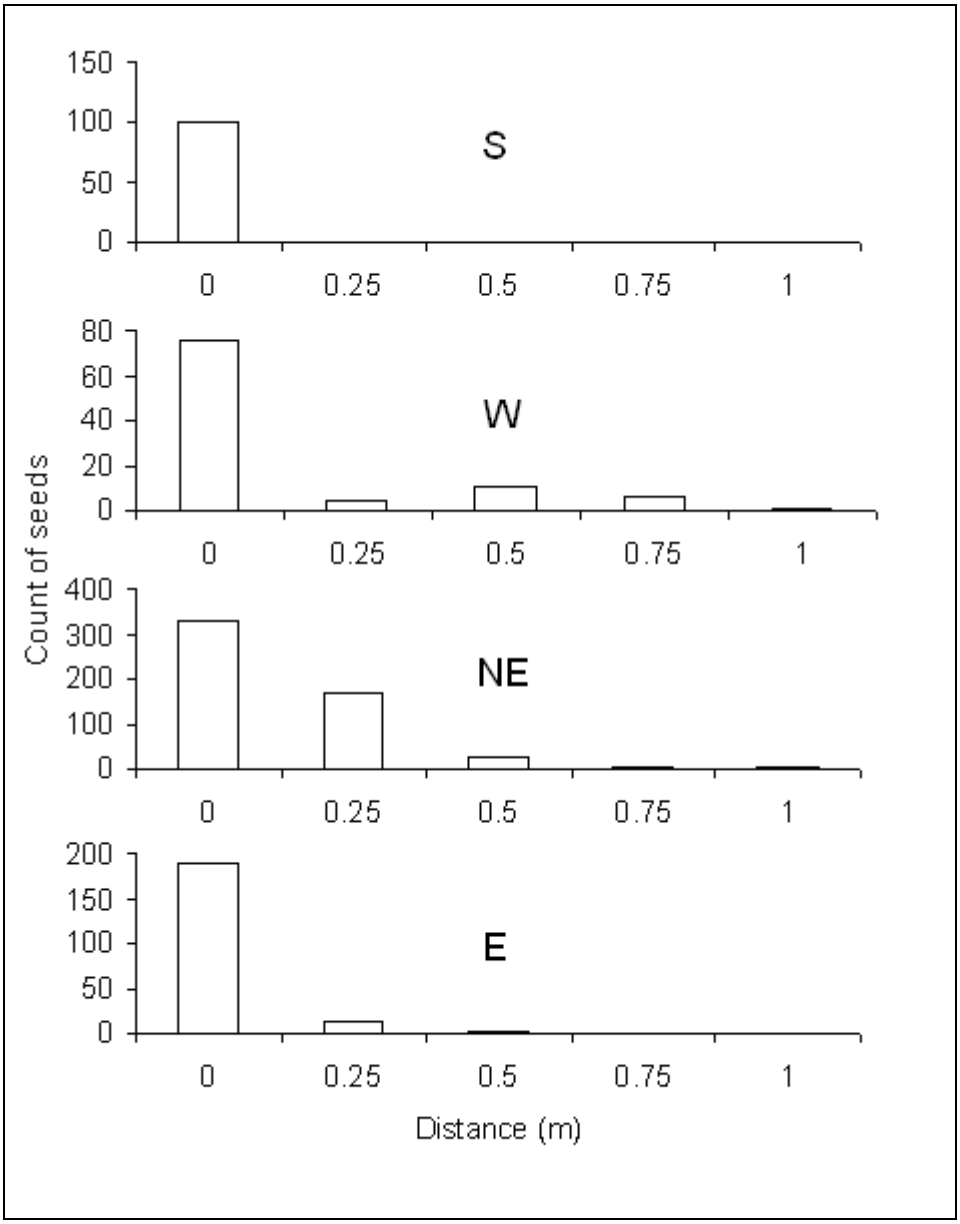

Figure 7.3. Results of 'Vaseline Slides' pilot wind dispersal experiment. Radii are as shown in Figure 7.1. Note the scale on the y axis changes for each radii.

Table 7.1. Scores awarded to each of the three methods for trapping *O. ramosa* seed.

Method	Ability to catch seed	Cost of unit	Ease of deployment	Ease of retrieval	Ease of seed counting	Total score
Sticky tape line	8	6	7	6	6	33
Vaseline slides	10	8	5	3	3	29
Taped slides	8	6	10	8	8	40

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