Longevity of *Parthenium hysterophorus* L. seed in the soil

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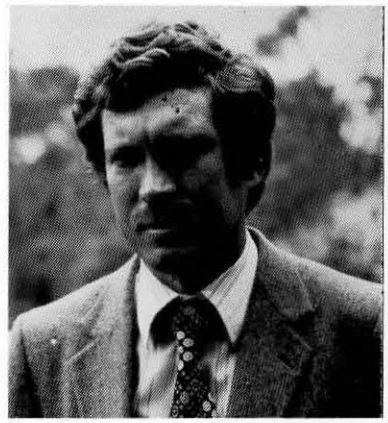

Summary

Seeds of parthenium *(Parthenium hysterophorus)* were buried in unsealed vials at depths of 0 to 20 cm and recovered at intervals of 1 week to 24 months. Germination declined from 66.2% at the beginning of the trial to an average of 11.5% after 2 years of exposure to field conditions.

Introduction

Parthenium *(Parthenium hysterophorus* L.) has spread rapidly through Central Queensland since 1973 (Haseler, 1976). Very little information is available on the survival and germination of soil-stored seeds, even though this knowledge is important in determining appropriate long-term control procedures.

Materials and methods

A single sample of parthenium seed was collected at Clermont in Central Queensland in January 1976 and aspirated to remove light and empty seed. Plastic vials of 20 ml capacity with five 3 mm diameter holes in the lid were filled with sand containing 33 parthenium seeds and buried horizontally in sandy loam soil on 30 June 1976 at depths of 0, 2, 4, 10 and 20 cm. Vials were recovered after intervals of 1 week and 1, 3, 6, 12 and 24 months and the seeds were extracted and germinated in the laboratory at 25°C in the dark. There were three replicates of each treatment.

Minimum and maximum air temperatures at Emerald were close to the long-term averages throughout the experiment, ranging from 7-8°C to 21-23°C in winter to 20-22°C to 35-36°C in summer. Rainfall was slightly higher than average with a total of 1540 mm during the two years of the experiment compared with an average annual rainfall of 632.9 mm.

Results

Harvest ant activity was severe soon after burial, with no seeds being recovered from the surface vials after periods exceeding 1 month. Even the sand was removed from some of the surface vials. Little harvest ant loss appeared to occur from vials buried in the soil. Apart from this, depth of burial did not significantly affect percentage recovery of seed. There was a significant decrease in percentage recovery after 1 month, and a gradual (though non-significant) decline after 3 months (Table 1).

Germination (expressed as percentage of seeds buried) declined from 66% initially (remaining seeds dead) to 12% at 24 months (Table 1). However, for those vials from which almost all the sown seed was recovered at 24 months, the level of germination was 31%. Depth of burial (excluding 0 cm) did not significantly affect longevity. After 24 months, germination ranged from 14% (2 cm) to 9% (20 cm).

There was no consistent evidence to suggest that depth of burial induced any secondary dormancy.

Discussion

Seed loss occurred as a result of harvest ant activity, field germination and seed decay, and whilst it was not possible to identify their individual influences, together they accounted for the fate of 60% of the seeds originally buried.

Despite the lack of any dormancy mechanism, a substantial proportion of parthenium seed is capable of surviving for at least 2 years under field conditions when buried at depths down to 20 cm. Coupled with its efficiency in seed production (Haseler, 1976), this indicates that control measures should aim at preventing seeding for at least 2 years.

Management practices should aim to keep the seed on or near the soil surface. The soil should be left as undisturbed as possible and cultivation should be avoided. Control should be achieved by frequent spraying with appropriate herbicides (Armstrong, 1978; Watson, 1979) because of the plants ability to flower over a wide range of temperatures and photoperiods (Williams and Groves, 1980).

References

Armstrong, T. R. (1978). Herbicidal control of *Parthenium hysterophorus* L. *Proceedings First Conference of Council of Australian Weed Science Societies, Melbourne.* pp. 157-64.

Haseler, W. H. (1976). *Parthenium hysterophorus* L. in Australia. *PANS* **22**:515-7.

Watson, K. A. (1979). Control of *Parthenium hysterophorus* with picloram and 2,4-D in Central Queensland. *Proceedings Seventh Asian-Pacific Weed Science Society Conference, Sydney.* pp. 133-6.

Williams, J. D. and Groves, R. H. (1980). The influence of temperature and photoperiod on growth and development of *Parthenium hysterophorus* L. *Weed Research* **20**:47-52.

Table 1 Effect of burial under field conditions on recovery and germination of *P. hysterophorus* seed

Field duration	Percentage of seeds recovered	Percentage of seeds recovered which germinated	Percentage of seeds buried which germinated
1 week	100.0	66.2	66.2
1 month	100.0	60.4	60.4
3 months	63.4	39.2	24.9
6 months	53.5	48.3	25.8
12 months	39.6	34.3	13.6
24 months	39.4	29.2	11.5
LSD			
$P<0.05$	29.5	14.5	
$P<0.01$	39.4	19.5	