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DISSEMINATION OF SEEDS OF *ERYNGIUM PANICULATUM* FROM ISOLATED PLANTS.I. RELATIONSHIP AMONG DIFFERENT TYPES OF SEED-TRAPS AND PLACEMENT HEIGHTS

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Abstract

Three different plastic collectors of seeds of 18 x 23 x 4.5 cm from an isolated plant of *Eryngium paniculatum* (Apiaceae-Saniculoideae) were placed at 5 and 75 cm heights from the ground to test their efficiency. Plastic nets placed at 5 cm above the ground showed better results.

Introduction

Eryngium paniculatum Cav et Dom ex Delaroche, has dispersed greatly in the last 10 years in the state of Tucumàn due to man's action and the diverse techniques of management in the grassing fields and partly abandoned crops. It belongs to Apiaceae (Saniculoideae) which flowers, an umbel of white chapters, cover big extensions at the bottom of the mountains in the west center of the state between 66°20' to 66° 40' Long. WG and 26° 45' to 27°30' Lat. S. *P. paniculatum* multiplies by division of the underground organs and by seeds, reaching values of real capacity of reproduction (RCR) of 93.6 (Chaila 1992), an Infestation Potency of 2.83 m^2/pl, an Index of Maximum Predominance C_{nmax} = 3.21 and an Index of Minimum Predominance C_{nmin} = 2.01 (Chaila, 1992, 1995).

The studies of seed dissemination from isolated plants aim to investigate in detail about the demographic functioning current and future of *E. paniculatum*, specially in relation to various degrees of perturbation. Various authors like Bradbeer (1988), Colosi (1988), Donald (1991), Donald *et al.*, (1991), Leguizamòn (1986) and Panetta (1988), studied aspects about the weed seeds dormancy, germination ability, survivorship, plant emergence, persistence of seeds in relation to types of soils, simulation models of survivorship and of emergence of seedlings. In these studies certain methodologies are established about the management of weed seeds that are taken into account in the present study.

The collection systems from a mother plant through sample collectors always left doubts. It has to be clarified that all sample collectors have to have certain characteristics such as: a) they accumulate water and all the received water should be drained, b) have defense mechanisms against insects and birds; and c) have covers to avoid being spread by the wind once they are collected or captured. These characteristics are considered in the three models that are described and used in the present study.

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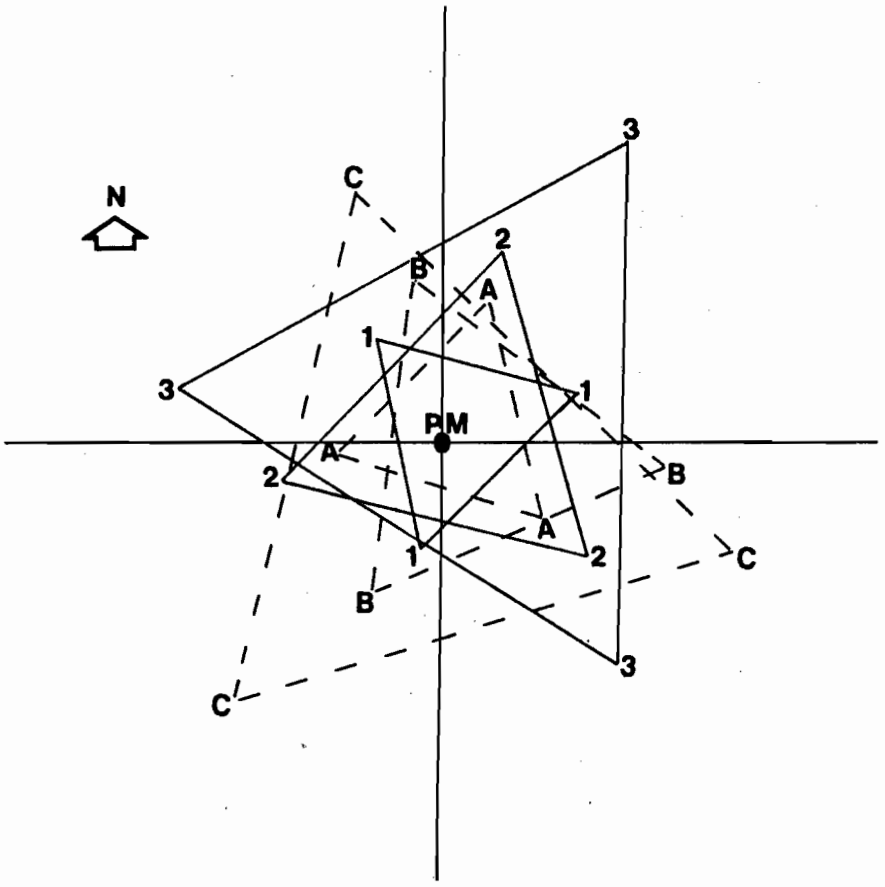

Fig.1. Arrangement of the seed-traps around the mother plant.

Particular methodologies about the way of sampling have been thought but specially related to the propagule beds from the soil (Leguizamòn *et al.*, 1982; Harmon *et al.*, 1992; Ghersa *et al*, 1983; Thompson, 1993). Kropac (1996) and Roberts (1981) established a sampling method by running in W form and a high number of small samples other than fewer big samples due to the tendency of seed distribution. The number of times to sample comes from a close relationship between the reliability of the results and the job capacity (Leguizamòn, 1983). Although these characteristics and conditions are not common for this study whereas Hayashi & Numata (1971) suggested for fewer samples in successive pioneer sites. The objective of the present study was to compare different forms of preparing the seed-traps and their level of placement.

Materials and Methods

Five experimental trials was established in different places of the state of Tucuman, Argentina:

Trial 1: El Manantial (Parque del Egresado)
Trial 2: El Manantial (non sowed field)
Trial 3: Garcia Fernandez
Trial 4: Horco Molle
Trial 5: Famaillà

Each of these trials had three replicates. In each experimental site a plant of *Eryngium* was isolated and its surroundings of 1.50 m were cleaned. The selected plant was a rosette without emerged floral stem. The isolations were done between October 1 and October 7. The distributions of the collector boxes or seed-traps were done between December 25, 1993 and January 5, 1994.

The arrangement of the seed-traps is indicated in Fig.1. This scheme was followed for each of the treatments and subtreatments. The treatments are the different types of net of the collectors (Fig.2) with 3 replicates each (1,2,3). The types of nets were

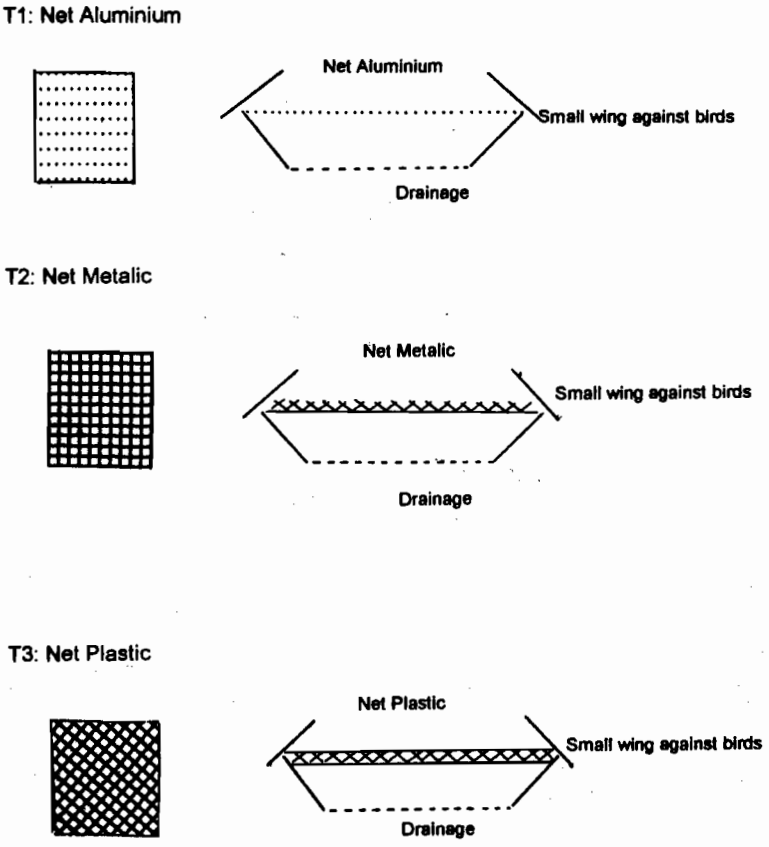

Fig.2. Different types of net.

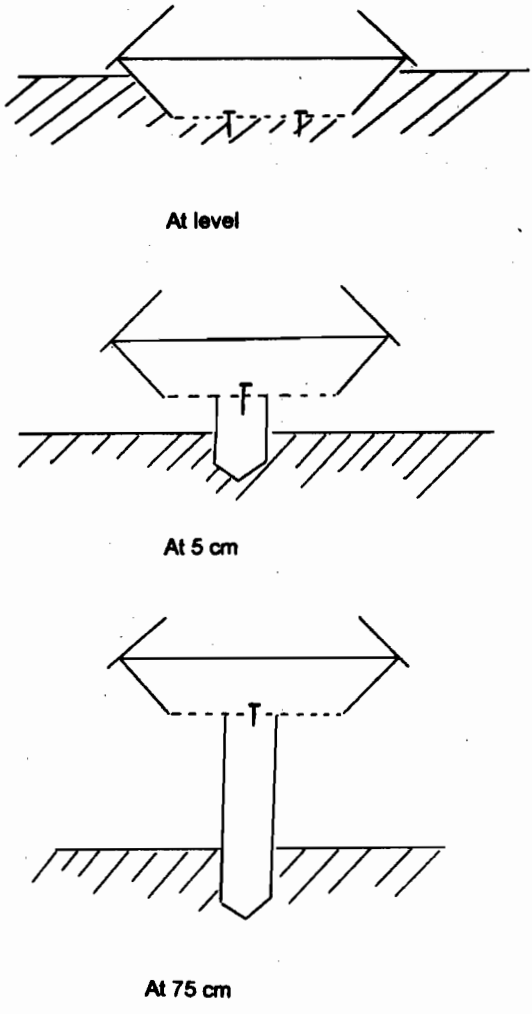

Fig.3. Different heights from the tray to the ground.

aluminum, metallic and plastic. The subtreatments were of different heights from the tray to the ground (Fig.3) with three replicates each (A,B,C) at ground level, at 5 cm and 75 cm above ground. The seed-traps are plastic traps of 18 by 23 by 4.5 cm. The results were analyzed statistically using a factorial model to study the possible interaction seed-trap-height of placement, as well as the possible differences among the different seed-traps and heights of placement. Tests of means were done for the seed-traps and for the heights of placement. The original values were transformed to square-root to fulfil the basic assumptions of the analysis of variance.

Table 1. Average number of seeds collected through different types of traps.

Type of traps	Experimental Places El Manantial	El Manantial	Garcia Femandez	Horco Molle	Famailla	Average
Net aluminum	5	3	1	2	2	2.5
Net metallic	10	12	20	15	10	13.4
Net plastic	19	30	35	25	20	25.8

Results and Discussion

Taking into account the exploratory tests done before, the size of the traps got selected on the basis of the desired characteristics of construction and assembling. The size used represents approximately the 10% of the clean surface on which the seeds have to fall and to the purpose of our study this is considered a plot. It is not a common sample on which the seeds have to fall, but it is an experimental plot, important aspect for the trial, besides the quality and quantity of the collected material.

In Table 1 the behavior of different types of traps is analyzed, the plastic trap is the one that shows the highest mean of 25.8 seeds and the one with metallic net shows a mean of 13.4 seeds. These traps are good to obtain disseminated seeds within natural populations but when we isolate a plant this should be covered completely with a plastic as a bed of collection around the mother plant at a height of 5 cm from the ground but this is not practicable.

Taking into account the studies done in *E. paniculatum* by Lallana & Elizalde (1991), it was proved that the collectors used by them were compared to the box-traps prepared for the present experiment. These exploratory observations allowed the necessary modifications to arrive to the proper size of the used traps and to the changes in the construction of them.

It is possible that the types of traps can be improved and other models adapted for different species of weeds, but it is thought that for *E. paniculatum* these models are the appropriate ones due to the results obtained and to the easy construction. In Table 2 the different heights of traps on the 5 experimental places are considered. The trap at 5 cm height is the one that captured the highest quantity of seeds with a mean of 18.4 seeds. In Table 3 the traps and their heights of placement are related and differential means

Table 2. Average number of seeds collected from different height of traps.

Height of traps	Experimental Places· El Manantial	El Manantial	Garcia Femandez	Horco Molle	Famailla	Average
At level	1	6	30	5	4	9.2
At 5 cm	20	30	20	7	15	18.4
At 75 cm	10	7	9	11	8	9

Table 3. Relationship between type of trap and height of placement.

Type of traps	Height of traps	Experimental Places El Manantial	El Manantial	Garcia Femandez	Horco Molle	Famailla	Average
Aluminum	At level	6	3	9	5	4	5.4
	At 5 cm	10	9	12	8	7	9.2
	At 75 cm	7	8	9	6	7	7.4
Metallic	At level	12	11	6	10	11	10
	At 5 cm	16	19	18	16	17	17.2
	At 75 cm	10	12	8	10	12	10.4
Plastic	At level	18	13	10	17	15	14.6
	At 5 cm	23	26	31	20	30	26.0
	At 75 cm	19	16	20	18	13	17.2

are established among the different types. The plastic net traps collected the highest quantity of seeds at a height of 5 cm with a mean of 26 seeds. The height of placement has to be taken into account because the traps placed on the ground or buried do not collect sufficient quantity of seeds and if they do, the losses due to insects, microorganisms and birds are high.

According to the statistical analysis there is no significant interaction between the types of seed-traps and the heights of placement of them. The tests of mean differences for the seed-traps show significant differences ($p < 0.05$) among them. There are factors to be considered when it is worked with different materials to make the traps and it is probable that a high number of type of nets have to be compared other than the three types analyzed in the present study. The same is inferred for the heights of placement of the traps, because the range between 5 and 75 cm is too broad and probably there are big differences every 10 cm or so.

The best trap was the one with plastic net of 1.5 mm of grid and placed at a height of 5 cm from the ground. The trap of plastic net collected a mean of 25.8 seeds of *Eryngium*. The traps of 5 cm from the ground captured 18.4 seeds and the relationship between type of plant and height of placement for this species is of 26 seeds on an average for the 5 cm and plastic net. In the present study, it was thought that the height of placement of the traps had to influence in the capture value of seeds, and the same is true with the different materials for the nets which practically showed the differences. Further studies should therefore be done with more net materials and placement heights.

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