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Temperature Effect on Autochory in *Colliguaya odorifera* (Euphorbiaceae)

by

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ABSTRACT. — *Colliguaya odorifera* Mol. is the only species of the Chilean matorral which shows an active dispersion of its seeds (autochory). This mechanism is dependent on daily variation of temperatures. Other climatic variables (air humidity of vapor pressure deficit) appear as not having direct influences on seed dispersal.

INTRODUCTION

Colliguaya odorifera is a characteristic shrub of the Chilean matorral, that generally grows in semiarid sites where the vegetation is scarce (Hoffmann and Hoffmann, 1976; Montenegro and Riveros, 1977), and is also found in disturbed or burned areas (Armesto and Gutiérrez, 1978). *C. odorifera* is the only shrubby species in Chile which shows an active dispersion of its seeds. This phenomenon is of the "ballistic" type and has already been mentioned for other species of the Family Euphorbiaceae (Pijl, 1972). However, little attention has been focused on the mechanism regulating this process.

In this paper, we attempt to answer some questions about the effect of climatic parameters on the frequency of fruit explosion of *C. odorifera* during the course of a day.

MATERIALS AND METHODS

DESCRIPTIONS OF THE SPECIES. — *Colliguaya odorifera* is a shrub of the Family Euphorbiaceae (Behn, 1942). The fruit is a smooth threegonic capsule of 17 ± 5 mm in diameter. The capsules are divided in three sections (Fig. 1). Each fruit has three spheric seeds with a diameter of 6 ± 1 mm and mean weight of 128 ± 3 mg per seed. The vegetative growth of *C. odorifera* occurs from September through December, the fruits appearing from November through February (Montenegro and Riveros, 1977). The dehiscence of the fruits occurs in a violent manner producing a characteristic sound clearly perceptible in a radius of 40 m.

STUDY AREA. — The study site is located in fundo Santa Laura (33°04'S Lat., 71°00'W Long.) at 1,100 m. The climate of the zone is of the mediterranean type with dry-hot summers and wet-cold winters (di Castri and Hajek, 1976). The main descriptive

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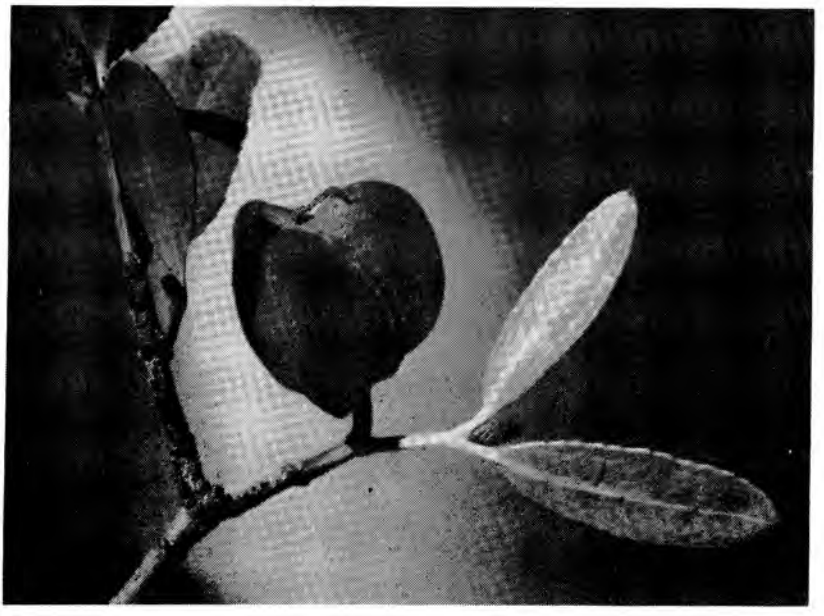

Fig. 1. Fruit of *Colliguaya odorifera*. (for description see text).

characteristics of the site have been reported by Thrower and Bradbury (1977) and Mooney (1977).

METHODS

The observations were made on 25 and 26 January 1974, and 20 and 21 January 1977. The chosen shrubs were separated at least 20 m of their nearest conspecifics and were growing on a flat surface with slopes below 5%. The height and diameter of the shrubs were 1.5 ± 0.2 m and 1.0 ± 0.1 m respectively.

The radius of dispersion of the seeds in regard to the center of the parental plants were measured. The smooth surface and the clear colour of the ground allowed an easy detection of the seeds around the shrubs.

The number of explosions provoked by the dehiscence of *C. odorifera* fruits was counted in equal time-intervals. Simultaneously, air temperature and relative humidity were recorded at a small macroclimatic station located close to the studied shrubs.

RESULTS AND DISCUSSION

The dispersion of *C. odorifera* seeds reached an area of 50 m^2, 2% of the seeds were projected to 16 m of distance from the center of the parental plant, 40% fell between 7 and 12 m, and a similar percentage dropped beneath the shrub crowns. On the other hand, 50% of the carpels was projected farther than 3 m of distance and 40% dropped beneath the projection of the shrub crowns.

The "ballistic" type of seed dispersion might be an adaptative mechanism of the species for evading possible problems of allelopathy or intraspecific competition. It would be very interesting to analyse these aspects in future research. Furthermore, this mechanism

of dispersion might explain why is this species found in open communities, and in many cases acting as a pioneer plant in disturbed or burned areas (Schlegel, 1966; Armesto and Gutiérrez, 1978).

Figure 2 shows that during the 4 days of observation the number of fruit explosions reached its maximum values between the 13:00 and 15:00h interval, which also correspond to that of maximum temperatures. However, the maxima reached by both variables is slightly out of phase which might be related to the fact that the higher

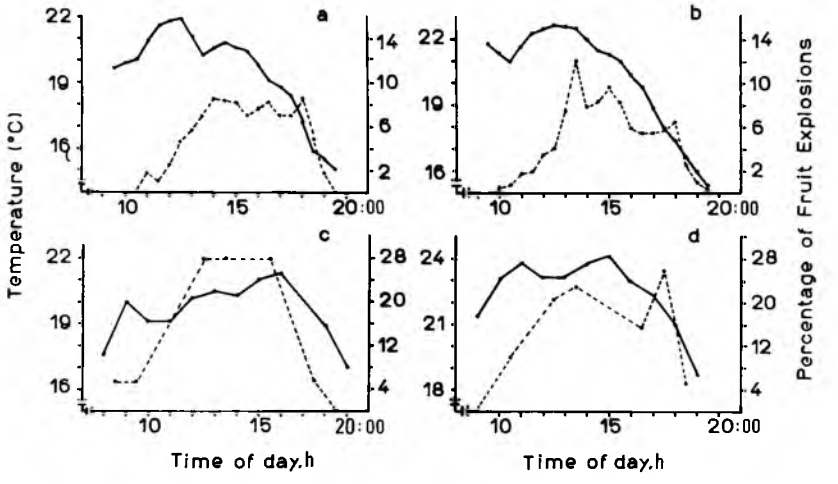

Fig. 2. Daily variation of temperature (solid line) and percentage of fruit explosions of *C. odorifera* (broken line). *a* and *b* represent the 20 and 21 january 1977; *c* and *d* correspond to the 25 and 26 January 1974.

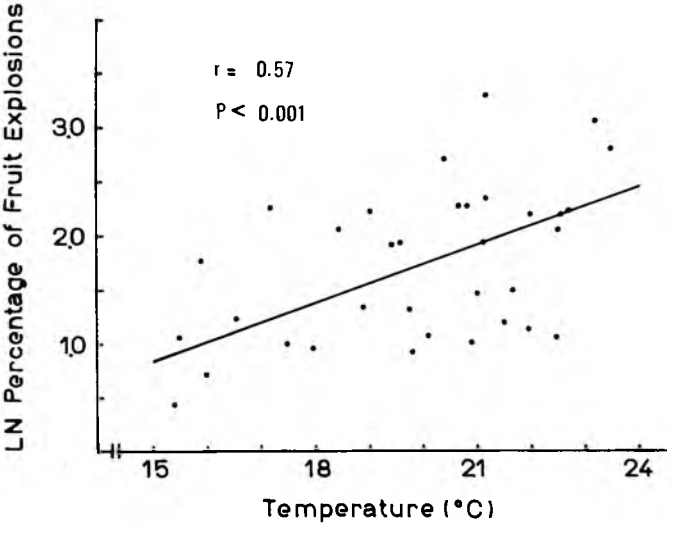

Fig. 3. Relationship between temperature and the logarithm (base e) of the percentage of fruit explosions in *C. odorifera.*

temperature of the fruits is reached immediately after that of the air. By relating both variables (Fig. 3) a good correlation between the temperature and the logarithm of the percentage of fruit explosions during the course of the day was found ($r = 0.57$, $P < 0.001$).

It is likely that the union of the carpelar tissues have a cell type that responds to the changes of temperature either by desiccation or by an increase of the vapor pressure inside the fruits. This might provoke the release of tensions of the fruits already ripened.

With regard to the relative humidity or the vapor pressure deficit no association with the number of fruit explosions was evident ($r = -0.39$ and 0.03, respectively, $P > 0.05$). This might be due to the fact that the relative humidity does not vary much at this site, because of the coastal effect (Miller et al., 1977).

In sum, we can conclude that *C. odorifera* is a clear example of autochory in the Chilean matorral, that the dispersion of its seeds covers a wide area around the parental plants and that the dehiscence of its fruits appears to be related to the variations of temperature along the day.

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