A mutant Pinus caribaea var. hondurensis seedling incapable of developing normal secondary needles

Sumario. Se describe una plántula mutante de **Pinus caribaea** var **hondurensis** que ha desarrollado ramas laterales pero que parece incapaz de desarrollar agujas secundarias normales

The rapid growth of tropical pines provides opportunities for morphogenetic studies, which could be useful in developing models for genetic and physiological interactions in these trees (1). A well known example of abnormal morphogenesis in *Pinus caribaea* var *hondurensis* Barr. & Golf. is the foxtail tree, which lacks lateral branches. In this report I will describe a mustant seedling that has developed lateral branches but appear unable to develop normal secondary needles.

In March 1973, secondary needle buds were found on a 5-4-day-old seedling of the *P. caribaea* var. *hondurensis* provenance 22/70 from Nicaragua. Since development of such buds within 8 weeks after germination is abnormal for this species, the seedling was tagged for continued observations.

In early July shoot elongation stopped, and numerous secondary needle buds developed near the shoot apex (such development, however, is characteristic when shoot growth stops). Shoot elongation began again in the latter part of August, and shortly afterwards secondary needle buds developed in the new growth region.

In all, more than 75 buds, ranging in age from several days to about 9 months, were observed from March through October. None of them developed into secondary needles. On any normal *P. caribaea* var. *hondurensis* seedling as shown in Figure 1, secondary needle buds would develop into needles within a few weeks after germination. In the abnormal seedling described here, the majority of older buds on the lower stem shrivelled up within 3 to 4 months after emergence. This deterioration was progressive, beginning with the buds near the cotyledon leaf scar and moving upward as the seedling grew.

In October two lateral branches developed at the shoot apex (Figure 1). Vigorous growth continued although primary needle length was somewhat less after the semi dormant period than before. In late November, two additional lateral branch buds were observed, one at the terminal apex and one in the center of the stem of the abnormal seedling. By January 1974 the seedling was 27 cm tall.

Secondary needles suddenly appeared in the mutant seedling during April 1974—a full year later than expected. The fascicle sheaths enclosing the needles were smaller than those of normal seedlings. The mean length and S.D. of 20 fascicle sheaths of this seedling was 4.6 mm ± 1.1 mm; sheaths of normal seedlings in the nursery range between 10 and 12 mm in length.

Whether the seedling had a genetic deficiency for a hormone that induces secondary needle development or

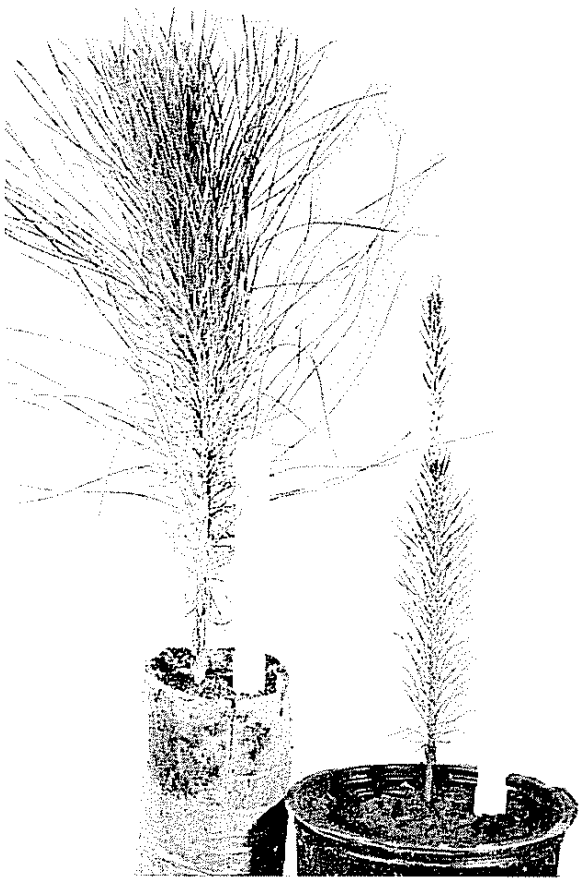

Figure 1.—*Ten month-old* P. caribaea *var.* hondurensis *seedlings with different needle development. The abnormal seedling on the right has two emerging buds near the tip of the growing point but has failed to develop secondary needles although many buds are present. The seedling on the left has developed normally.*

whether needle development was suppressed is not known. Bud dormancy is induced by abscisic acid and released by gibberellic acid. Synthesis of these hormones in some plants is controlled by day length: abscisic acid is produced under short days and gibberellic acid, under long days. Provenance 22/70 was collected from latitude 13°34'N and longitude 84°17'W in Nicaragua. The experimental nursery in Puerto Rico is located at coordinates 18°27'N and 66°05'W. Although the small change in day length may have altered hormone synthesis sufficiently to give rise to this abnormal development, it is more likely that the seedling is a mutation, lacking necessary hormones. Of 600 seedlings of this provenance, only this seedling did not develop normal secondary needles.

The failure of this seedling to develop normal secondary needles from existing buds, while simultaneously developing lateral branches, suggests that development of these structures is regulated by different genetic and

physiological mechanisms Likewise, branch bud development and secondary needle bud development in foxtail trees may also be stimulated by different regulatory systems

If this seedling survives in the arboretum and develops viable reproductive organs, it will be used for controlled crosses with normal trees Genetic and physiological studies of seedlings in a series of crosses may indicate if they lack the genes which control secondary needle development or if the genes are present but suppressed

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