

SEED CHARACTERISTICS OF *Pinus brutia*  
FROM VARIOUS LOCATIONS OF SAMOS ISLAND

C. A. Thanos and E. N. Daskalaku

Institute of General Botany, University of Athens, Athens 15784, Greece

SUMMARY

Closed cones of *Pinus brutia* were collected in Samos Island. Values were calculated for the following parameters: total number of seeds per cone, germinability of seeds per cone, seed weight, seed coat weight, germination (yes or no), cotyledons per seed. Cotyledon numbers showed considerable stability within individual trees and were statistically significantly correlated with seed weight.

INTRODUCTION

De Ferré (1965) has compiled an extensive tabulation of the gross anatomical characteristics of pine embryos with particular reference to cotyledons. In a long list of 41 *Pinus* taxa, the mean number of cotyledons per seed ranged from 3.80 (*P. contorta*) to 13.76 (*P. coulteri*), while from the examination of 275 seedlings of *P. brutia* of Turkish origin a mean number of 8.51 cotyledons per seed (with a range of 6-11 cotyledons per seed) was measured (De Ferré, 1965). The mean cotyledon numbers per seed for 6 Turkish provenances show considerable variability and they range from 8.15 up to 9.19 with a gross average of 8.77 cotyledons per seed (Isik 1986).

MATERIALS AND METHODS

Closed mature (1984) cones (n=51) of *Pinus brutia* were collected in November 1984 from 17 pine trees of various ages, growing in 5 different

localities of Samos Island (Vathy, Posidonio, Kontakeika, Pyrgos and Paliokastro). The cones were opened by mild heating (several days at 40 °C) in the laboratory and the seeds liberated were counted, weighed and subsequently placed for germination, in Petri dishes at 20 °C, in the dark (Thanos and Skordilis, 1987). Germinated seeds were transferred to pots and grown until the number of cotyledons could be clearly measured. In most instances the seeds were marked in order to correlate, at the individual seed level: seed weight, seed coat weight, germinability and cotyledon number.

Seed collection was repeated in November 1985 from two trees (#1 and #9). Supplementary measurements of cotyledon numbers were carried out on seedlings germinated from seeds collected from Samos (1983) or furnished by the Forestry Service of Greece (see Fig. 10).

## RESULTS & DISCUSSION

Fig. 1 shows general cone and seed data; the germinability (81%) is quite satisfactory although sound seeds are more than 95% (Panetsos, 1981, and Isik, 1986, give for their batches 91.5 and 92%, respectively). In only a few cases (e.g. in cone 17.1, Fig.2) a significant proportion of unsound seeds was observed, as revealed by the weight profile. Mean seed weight was considerably more variable among trees than within a tree (Fig. 3); the grand mean has a value higher than the gross average of seed weight reported (Panetsos, 1981) from various Greek provenances (40.45 mg, while for Samos 44.12 mg) but lower than that (63.8 mg) of 6 Turkish provenances (Isik, 1986). Seed coat contribution (Fig. 4) is quite high, ranging between 52 and 64% of total seed weight.

Mean number of cotyledons per seed were found much more variable among trees (irrespective of the locality), as shown in Fig. 5, than among cones of the same tree (e.g. Fig. 7). Furthermore, a definite correlation with

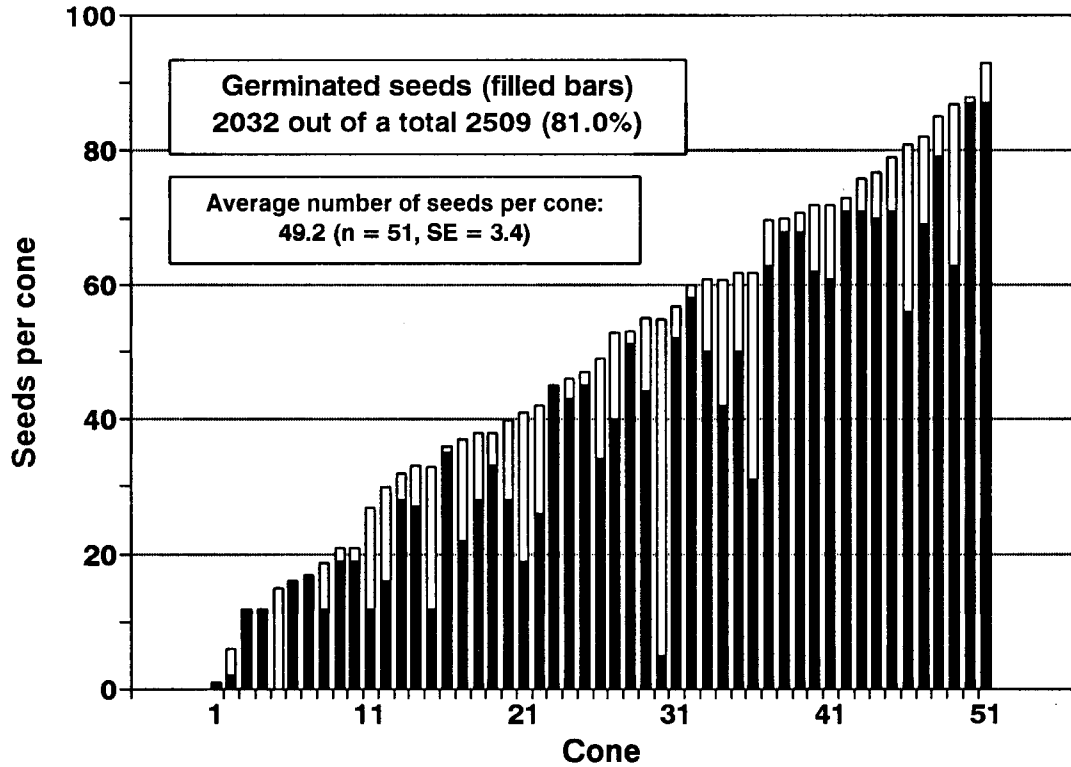


Figure 1. Seeds contained in 51 cones collected (1984) from 17 *P. brutia* trees growing in 5 localities of Samos Island.

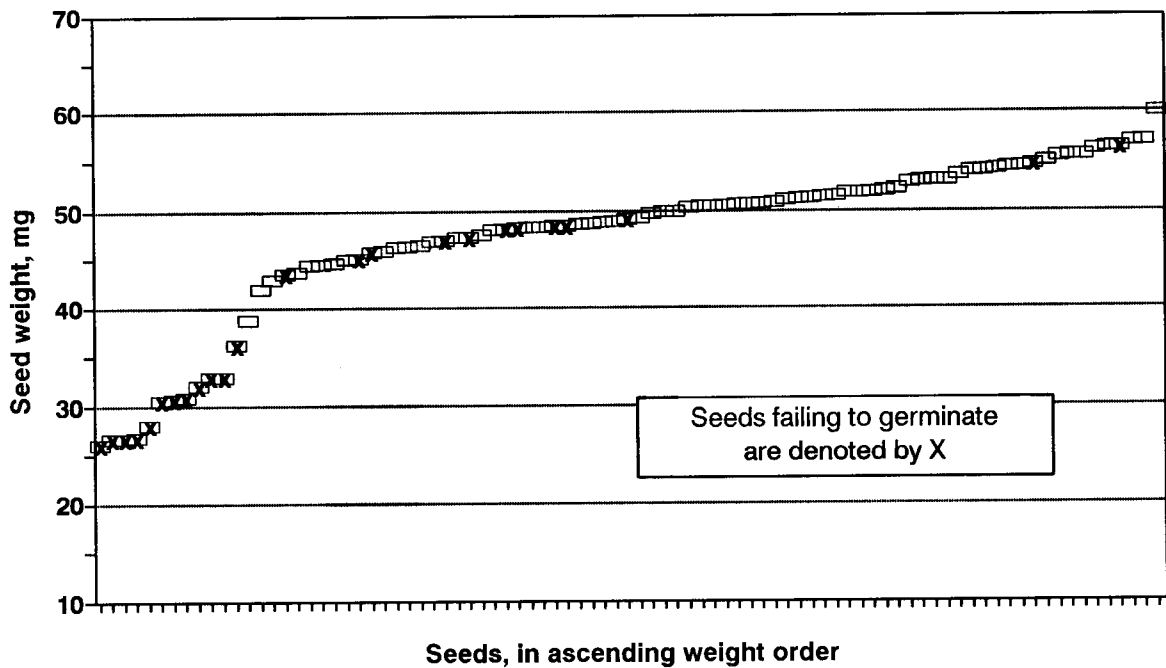


Figure 2. Seed weight profile in cone 1 of tree #17 (87 seeds) and its relationship to germinability.

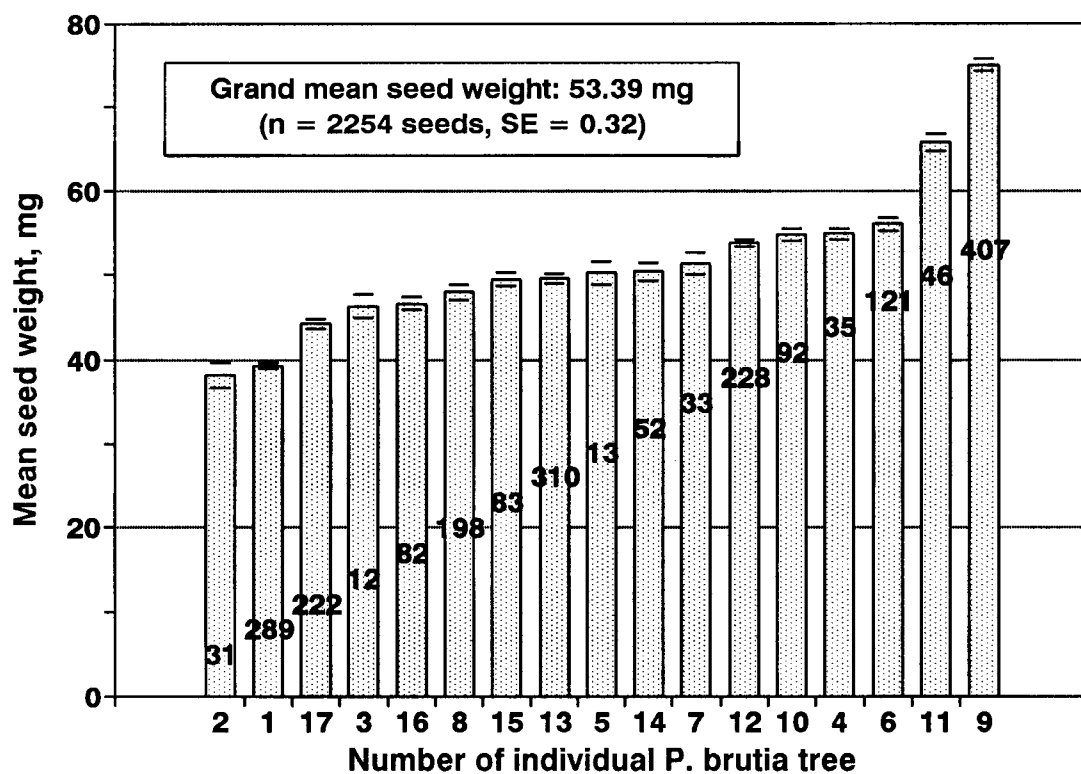


Figure 3. Mean weights of *P. brutia* seeds in each of the 17 trees; inset numbers represent n and horizontal bars  $\pm$  SE.

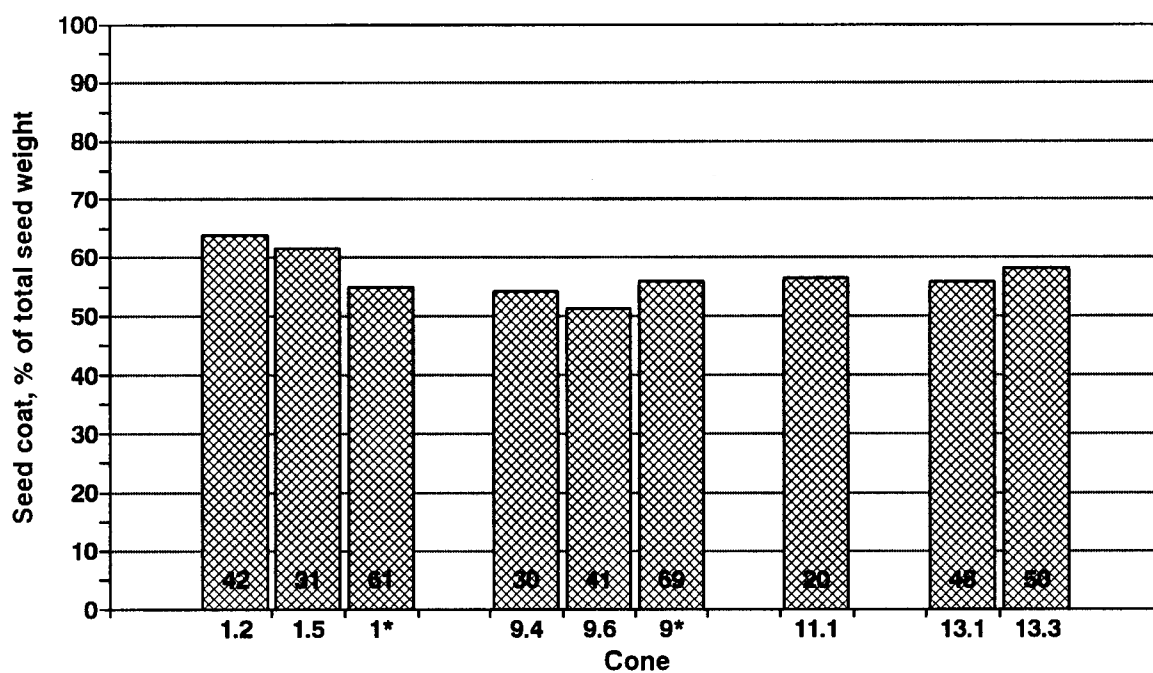


Figure 4. The contribution of seed coat to total seed weight in cones of 1984. Asterisks represent 1985 collection (several cones) and insets n.

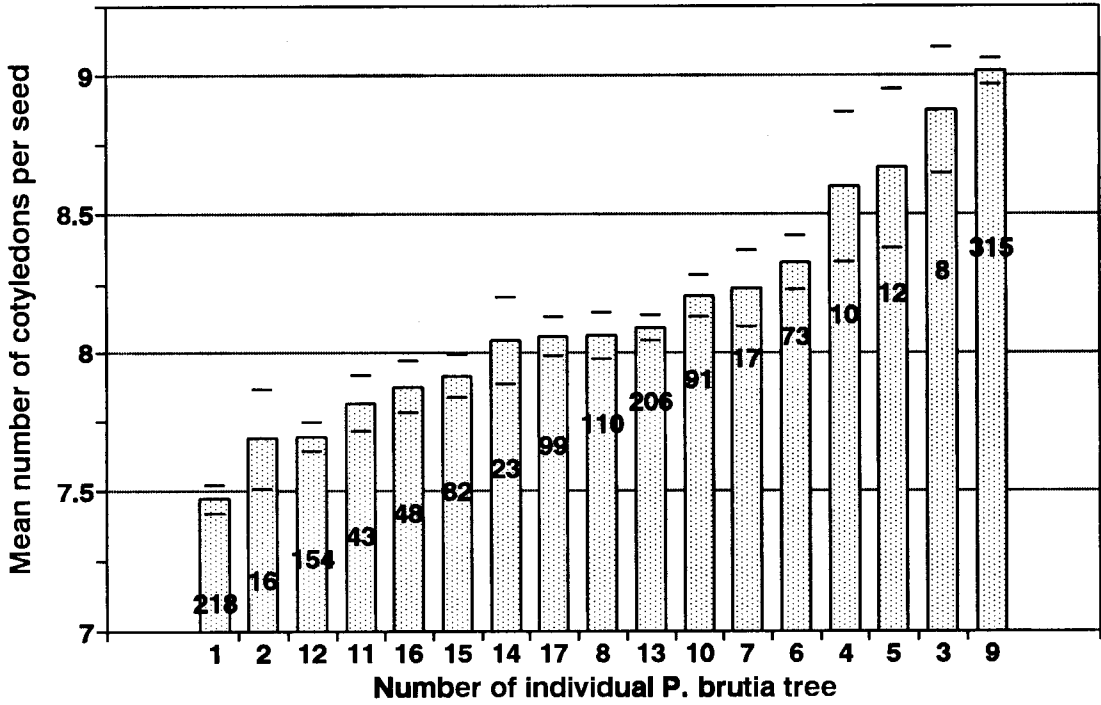


Figure 5. Mean number of cotyledons per seed in each of the 17 *P. brutia* trees; inset numbers represent n and horizontal bars  $\pm$  SE.

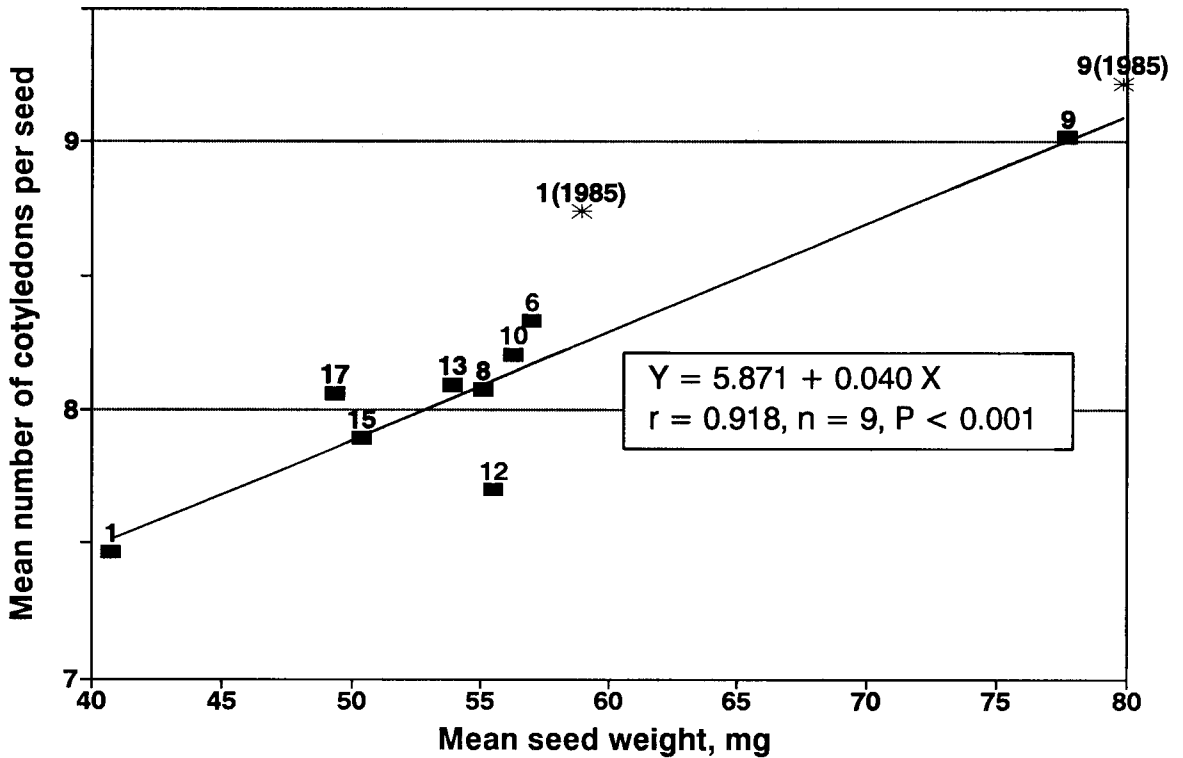


Figure 6. Correlation of cotyledon numbers and seed weight. Internal labels correspond to tree number (only trees with  $n > 50$  have been included).

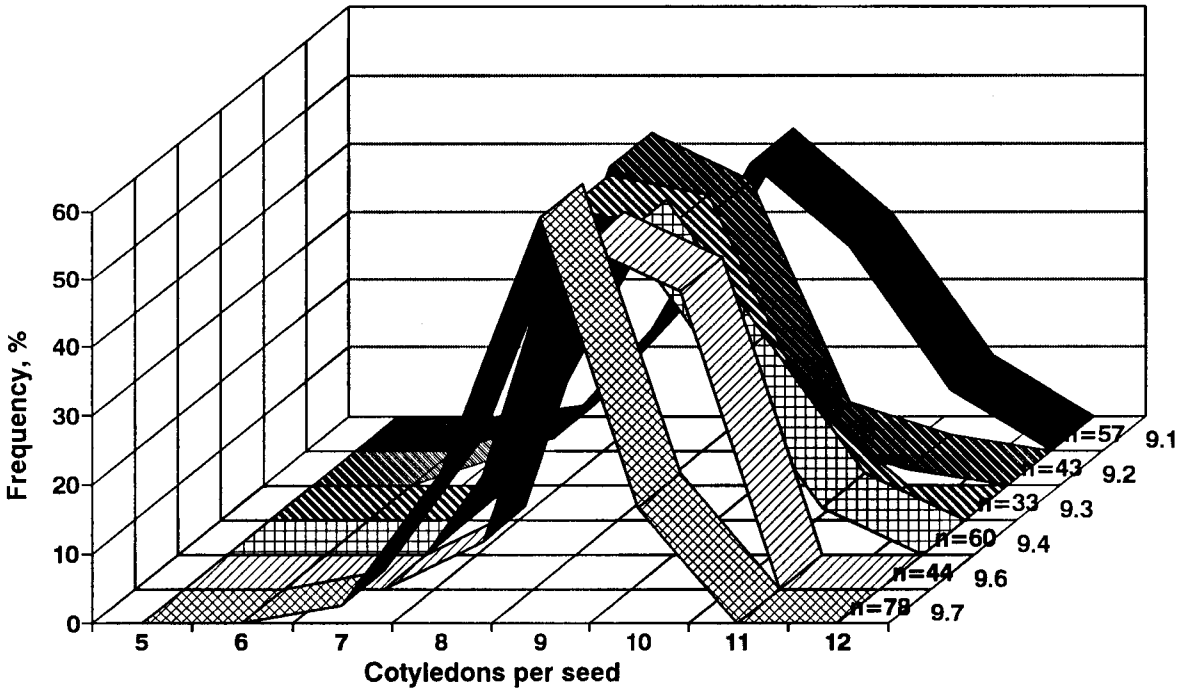


Figure 7. Frequency distributions of cotyledons per seed for each of the 6 cones of *P. brutia* tree #9 (1984).

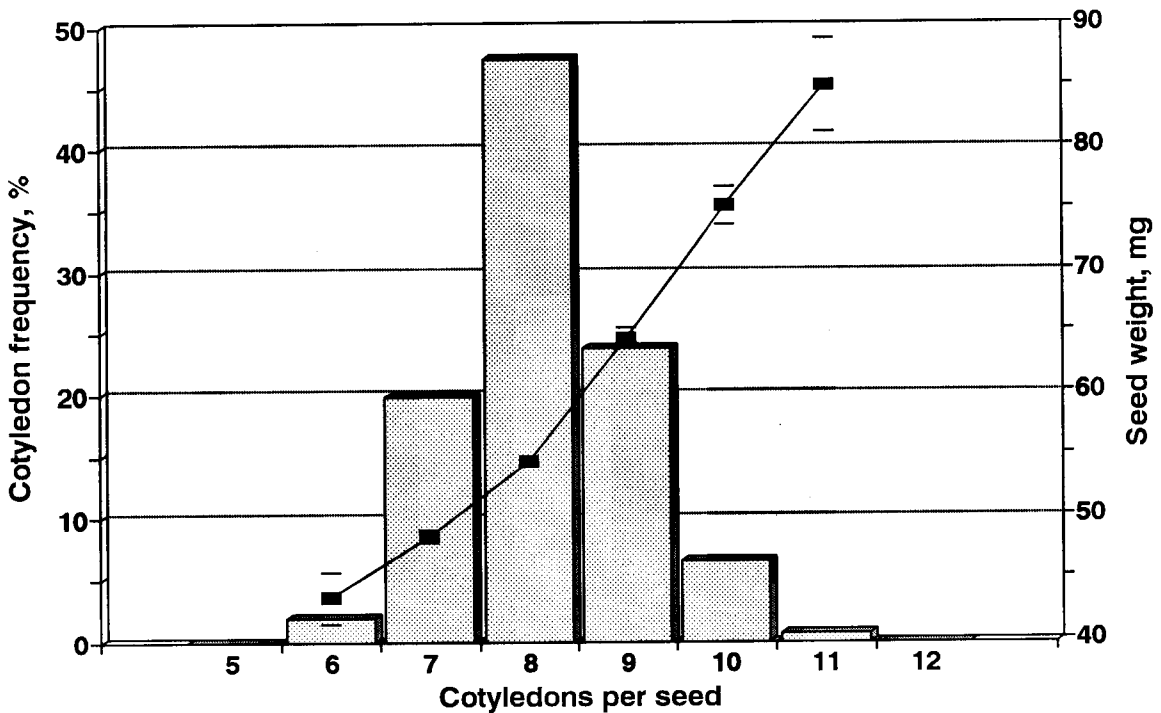


Figure 8. Frequency distribution of cotyledons per seed for the total of 1526 seeds (17 trees, Samos 1984). Seed weight ( $\pm$  SE) is shown for each cotyledon number class.

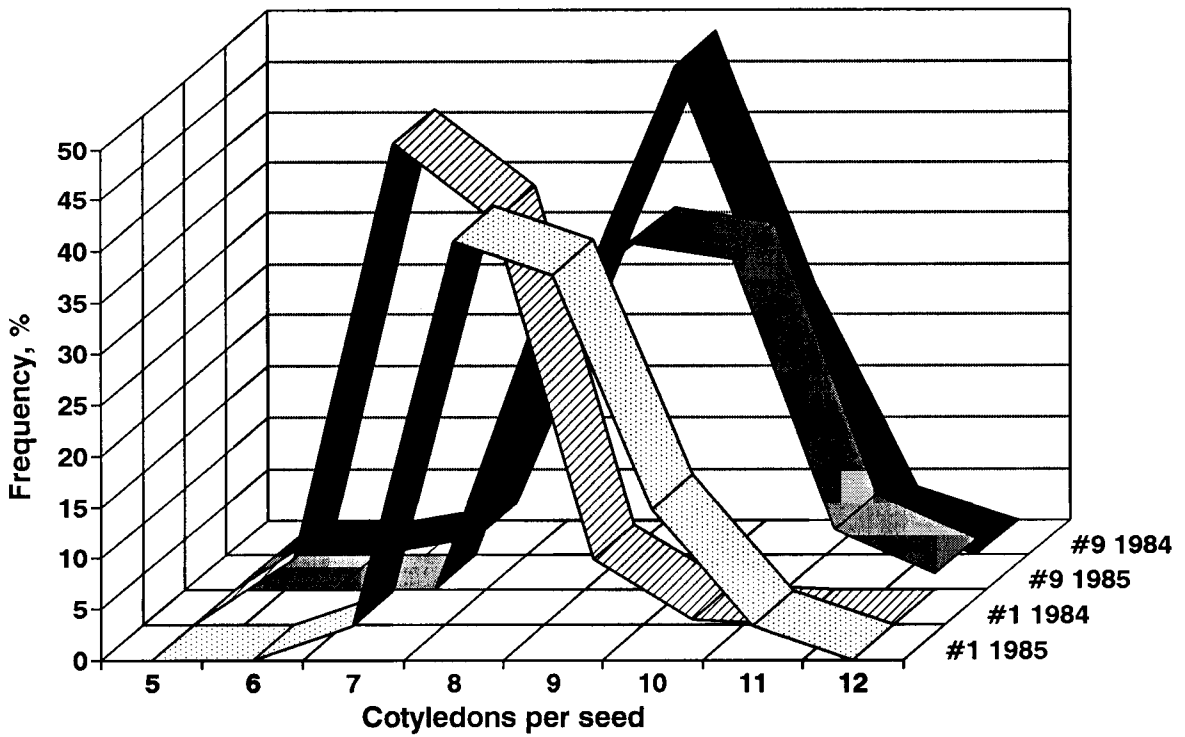


Figure 9. Frequency profiles of cotyledon numbers per seed for seeds of 1984 and 1985 from *P. brutia* trees #1 and #9.

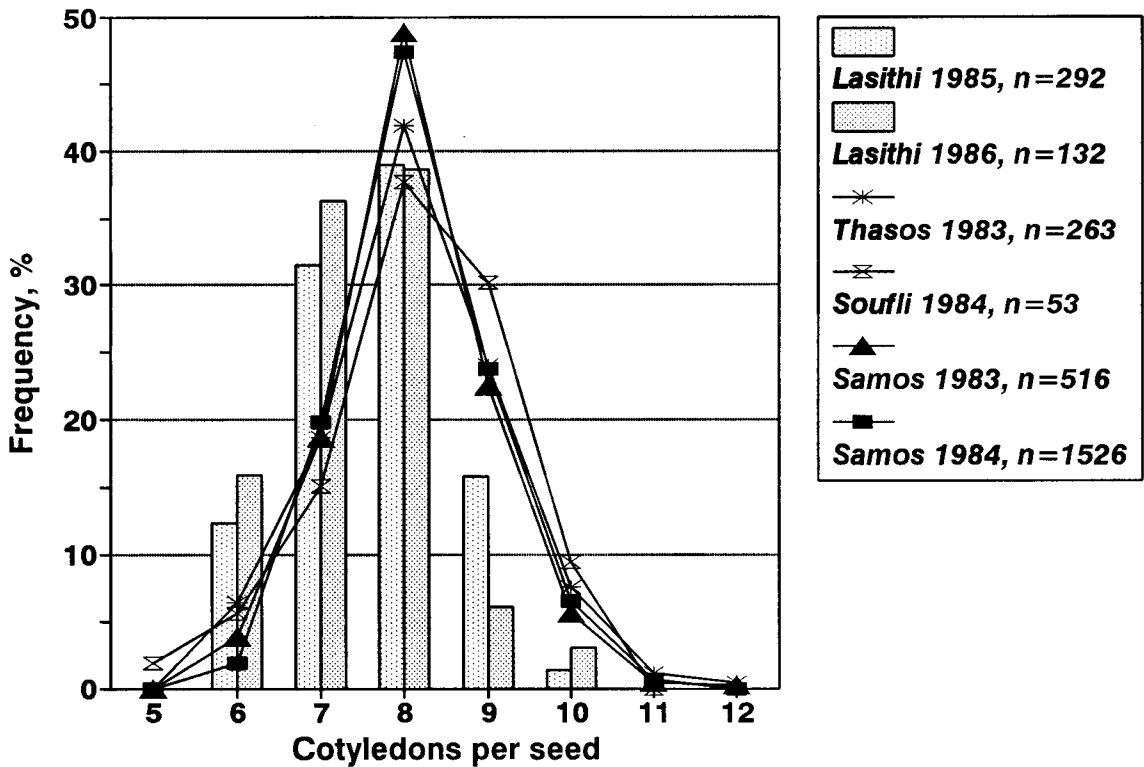


Figure 10. Frequency distributions of cotyledon numbers per seed for 6 Greek provenances of *P. brutia*.

seed weight is shown in Fig. 6 (and indirectly in Fig. 8).

The frequency distribution of cotyledon numbers from the whole seedling population is evidently normal, with a mode of 8 and a mean value of 8.152. Frequency distributions of cotyledon numbers from the same trees but of different maturation year are compared in Fig. 9. Although the profiles of tree #9 are similar (mean values 9.016 and 9.221 for 1984 and 1985, respectively) in those of tree #1 there is a marked shift (mean values 7.470 and 8.682, for 1984 and 1985, respectively) followed by only a significant seed weight increase (40.75 and 58.94 mg, for 1984 and 1985, respectively; see also Fig. 6).

From the frequency profiles (Fig. 10), the central and northern seed populations (Samos, Thasos and Soufli) are similar (mean values around 8.1-8.2) while seeds of southern origin (Lasithi) have consistently lower cotyledon numbers (average around 7.5). Nevertheless, all Greek provenances seem to have a considerably lower mean cotyledon number, at least as compared with the data by De Ferré (1965) and Isik (1986).

#### REFERENCES

- De Ferré Y. 1965. Structure des plantules et systématique du genre *Pinus*. Bull. Soc. Hist. Nat., Toulouse, 100:1-50.
- Isik K. 1986. Altitudinal variation in *Pinus brutia* Ten.: seed and seedling characteristics. Silv. Genet. 35:58-67.
- Panetsos C.P. 1981. Monograph of *Pinus halepensis* (Mill.) and *P. brutia* (Ten.). Ann. For. (Zagreb) 9:39-77.
- Thanos C.A., Skordilis A. 1987. The effects of light, temperature and osmotic stress on the germination of *Pinus halepensis* and *P. brutia* seeds. Seed Sci. Technol. 15:163-174.