mine sur des critères anatomiques ou morphologiques (CRITCHFIELD 1957) notamment entre latifolia et murrayana pourrait expliquer cette absence apparente de differenciation. Entre latifolia et contorta, il semble d'après CRITCHFIELD que les interférences entre les aires des 2 sous-espèces soient limitées a quelques points dont la basse vallee de la Skeena River en Colombie Britannique.

I1 faut reconnaitre également que le poids de la graine ne constitue qu'un critere parmi d'autres et qu'il est difficile de se baser sur un seul facteur pour faire des hypotheses sur l'evolution ou la différenciation génétique. Les plantations comparatives realisees a partir de ces 140 provenanees permettront certainement d'aller beaucoup plus loin.

Sur un plan pratique enfin, il ne semble pas que le poids de la graine et les équations prédictives puissent servir de moyens a un éventuel contrôle de l'authenticité de l'origine de certains lots de graines. La precision des modèles developpes a en effet ses limites; de plus certaines sous-espèces (latifolia et contorta) se discriminent mal sur ce critère. Cependant on peut affirmer qu'un lot de graines dont le poids de 1000 graines excederait 6 g. doit être rattaché a la sous-espèce murrayana.

Bibliographie

ALLEN, G. S., 1960: A method of distinguishing coastal from interior Douglas-fir seed. Br. Columbia Lumbermann 44 (8): 26—30. — ANDERSSON, E., 1965: Cone and seed studies in Norway spruce (Picea abies KARST.). Stud. For. Scie. 23: 1—214. — BARNER, H., 1968: Circular letter n0 2 and n0 3. — BERNEY, J. L., 1972: Studies on the probable origin of some european Douglas-Fir (Pseudotsuga menziesii (MIRB. FRANCO). M. F. Thesis. University of British Columbia, Vancouver p. 99. — BIROT, Y., 1972: Variabiiite intraspecifique du poids de la graine chez le Douglas. Silvae Genetica 21 (6): 230—242. — BOUVAREL, P. et LEMOINE, M., 1958: Note sur les reboisements; Races de mélèze et grosseur des graines. Rev. For. Française 5: 348—350. — BURLEY, J., 1965: Variation in seed characteristics of Sitka spruce. Adv. Front. Plant Sci. 10: 11—24. — CALLAHAM, R. Z., and HASEL, A. A., 1958: Height growth of Ponderosa pine progenies. Proc. Soc. Amer. For. 1957: 61-62. — CRITCHFIELD, W. B.: Geographic variation in Pinus contorta. Maria Moors Cabot Foundation Publ. n0 3. 119 p. Cambridge, Mass Harvard Univ. Press. — DUTKIEWICZ, W., 1968: Variation in seed weight in relation to boundaries of two ranges of spruce in Poland. ex: Population Studies of Norway spruce in Poland Warszawa IBL 45 51. — EL LAKANY, M. H., and SZIKLAI, O., 1971: Intraspecific variation in nuclear characteristics of Douglas-Fir. Adv. Front. of Plant Science 28: 363—378. — FOBER, H., and GIERTYCH, M., 1971: Variability of Picea abies seed size, weight and mineral content in Poland Arboretum Kornickie Rocznik XVI, 1971, p. 121—130. — FRANKLIN, J. P., and GREATHOUSE, E., 1968: Seed origin studies: noble California red fir species complex. Proc. W. For. Nurs. Counc.: p. 11—16. — GENYS, J. B., 1968: Geographie variation in eastern white pine. 2 years results of testing range wide collection in Maryland. Silvae Genetica 17 (1): 6—12. — GRIFFIN, A. R., 1974: Geographie variation in juvenile growth characteristics of Douglas-Fir (Pseudotsuga menziesii, MIRB. FRANCO) from the coastal Ranges of California. Ph. D. Thesis O.S.U. Corvallis. — GRIFFIN, A. R., and CHING, K. K., 1977: Geographie variation in Douglas-Fir from the coastal ranges of California. I Seed, seedling growth and hardiness characteristics. Siivae Genetica (sous press). — HELLUM, A. K., 1969: Variation in cotyledon number and seed weight in white spruce in Alberta. Comm. For. Tree Breeding Can. Québec 1968, Part. 2, 1969, p. 65—76. — LINES, R., 1976: Circular letter no. 7. — MASCHNING, E., 1971: Die Variation der Kotyledonenzahl bei einigen Pinus contorta Herkünften. Silvae Genetica 20 (1): 10—14. — MORGENSTERN, E. K., 1969: Genetic variation in seedlings of Picea mariana (MILL.) BSP 1 Correlation with ecological factors. Silvae Genetica 18 (5-6): 151—160. — SWEET, G. B., 1965: Provenance differences in Pacific coastal Douglas-Fir. 1 Seed and seedlings characteristics. Silvae Genetica 14 (2): 46—56. — SZIKLAI, O., 1969: Preliminary notes on the variations in cone and seed morphology of Douglas-Fir. Proc. 2nd. World Conf. on Forest Tree Breeding 1: 687—689. — WRIGHT, J. W., and BULL, W. I., 1963: Geographic variation in Scotch Pine. Silvae Genetica 12 (1): 1—25. — YAO, C., 1971: Geographie variation in seed weight, some cone scale measurements and seed germination of Douglas-Fir (Pseudotsuga menziesii (MIRB.) FRANCO). M. F. Thesis U.B.C. Vancouver 88 p.

An albina-type natural chlorophyll mutant in Gmelina arborea Roxb.

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Summary

A spontaneously arising pure white seedling mutant in Gmelina arborea, is reported, the first of its kind in this tropical forest tree species. The potential value of such chlorophyll mutations as early genetic markers in seed orchard management, is indicated.

Key words: Chlorophyll mutant, Gmelina arborea.

Zusammenfassung

Es wird über eine spontan entstandene rein weiße Sämlingsmutante bei Gmelina arborea berichtet, die erste bei dieser Waldbaumart. Auf den potentiellen Wert solcher Chlorophyllmutationen als genetische marker in Samenplantagen wird hingewiesen.

Introduction

As a fast growing tree for the lowland tropical zone, there is increasing international interest in Gmelina (LAMB, 1968). It has been successfully introduced in several countries outside its natural range, especially in Africa and Latin America. First stage provenance collections are now underway (LAURIDSEN, 1977), and in due course, a regular controlled breeding programme is quite likely to develop on this valuable species. It was deemed desirable therefore, to gather in advance, basic genetic data which might eventually serve as a logical base for such a future improvement scheme. No work has yet been dune, for instance, on the pollination and mating system of this species, even though its large, inch-long flowers provide suitable material for such research.

Material

There are several mature trees of the species growing on the New Forest estate of the Institute. But all of them are quite tall and therefore their flowering crowns are not safely approachable even with ladders. As an alternative therefore, it was decided to establish shoot cuttings or

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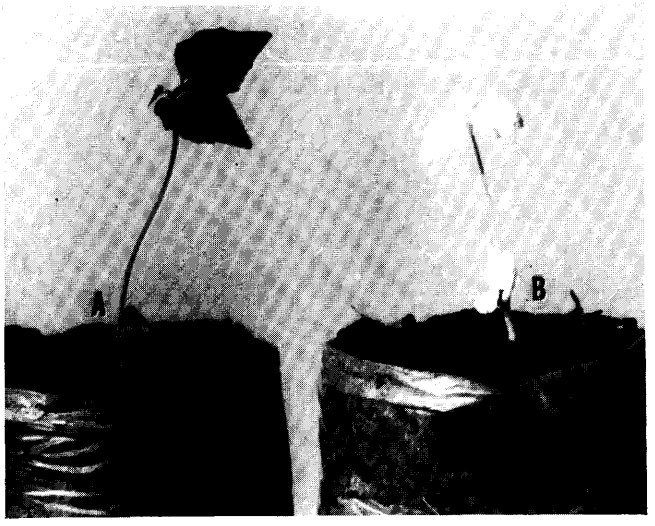

Fig. 1. — A. Normal green seedling; B. Mutant white seedling.

budwood material from the potentially flower bearing crowns of these trees, as grafts, at low heights, convenient for controlled pollination work, as had earlier been successfully done in *Bombax ceiba* L. (VENKATESH and ARYA, 1967) another valuable native tree. In order to raise suitable rootstock for grafting and budding purposes, fruit stones from a local bulk seed source were sown in successive lots on pure quartz sand in trays kept on laboratory benches during the day but transferred at night into seed germination cabinets maintained at 30° C constant temperature.

Observations

Of the twelve germinants in the very first seedlot sown as above, one appeared like an albino. All germinants of this lot were then transferred into separate polybags filled with garden soil, and kept permanently at room temperature (about 20—25° C) on the laboratory table, near a window, to ensure adequate exposure to natural daylight. However, even after several days of such exposure, this particular seedling remained pure white and failed to develop any trace of chlorophyll in the cotyledons, stem or first pair of leaves *(Fig. 1)*. Expectedly, while the normal green seedlings continued to grow, this mutant seedling remained stunted, sickened and began to die, whereupon it was preserved in formalin for anatomical investigations.

Post mortem examination of free hand sections under an ordinary light microscope revealed that whereas mesophyll cells in the cotyledons and leaves of normal green seedlings were densely or well stocked with numerous large chloroplasts, comparable cells of the albino seedling contained very few and small chloroplasts which presumably also lacked normal photosynthesizing ability.

Possibly, the single albino seedling described here, originated by natural selfing on a tree heterozygous for this deviant trait. One-parent progeny testing with open pollinated seeds should duly help in the identification of this particular tree heterozygote, which may thereafter be clonally propagated and used for controlled selfing and crossing studies.

Discussion

Chlorophyll lethals constitute a characteristic mutation type that is frequent in higher plants, although, up till now, there are few well documented cases known of them in tropical forest tree species (VENKATESH and EMMANUEL, 1976). They may be of various kinds and have been classified by GUSTAFSSON (1940). The mutant seedling described here, being without pigments and purely white in colour, conformed to the *albina* type of that classification.

Obviously, lethal albino homozygotes by themselves cannot be of any practical value. However, clone individuals heterozygous for such mutant traits can serve as useful genetic markers for monitoring the degree of natural crossing and selfing in future seed orchards established for the genetic improvement of *Gmelina arborea*, in tropical countries.

Literature Cited

GUSTAFSSON, A.: The mutation system of the chlorophyll apparatus. Lunds. Univ. Arsskr. N. F. Avd.. 2. 36 (11): 1—40 (1940) refd. in: Proc 5th World Forest Congr. II: 793—805 (1960). — LAMB, A. F. A.: *Gmelina arborea.* Fast growing timber trees of the lowland tropics, No. 1: 31 p. C. F. I., Oxford (1968). — LAURIDSEN, E. B.: *Gmelina arborea* — international provenance trials study tour and seed collection in India, 1976. FGRI — No. 6, p. 24—37 (1977). — VENKATESH, C. S., and ARYA, R. S.: Observations on the flowering and fruiting behaviour of *Semul* grafts. Indian For. 93: 586—587 (1967). — VENKATESH, C. S., and EMMANUEL, C. J. S. K.: Spontaneous chlorophyll mutations in *Bombax* L. Silvae Genet. 25: 137—139 (1976).