

VII—11. INTRASPECIFIC VARIATIONS AT BIOCHEMICAL LEVEL IN *PINUS KESIYA* ROYLE EX GORD. POPULATIONS GROWING AT DIFFERENT ALTITUDES

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The growth and development of many plant species growing in different environmental conditions vary considerably. The plants adapt themselves to prevailing environmental conditions by means of various physiological, biochemical and genetic mechanisms. Significant differences in seedling height and biomass in *Pinus rigida* seeds obtained from two contrasting situations, namely normal stature (Barrens) and pygmy (Plains) of New Jersey, U.S.A. have been reported, when grown under green-house-nursery and phytotron conditions (Good and Good, 1975). Plain's progeny were shorter and lighter than their Barren counterpart due to poor and shrubby growth of the former. It was reported that inherent characteristics of Plain trees contributed in part to their stunted nature. There are reports that polyploidy has not contributed to the evolution and speciation of gymnosperms and the observed differences in DNA amounts without ploidy may in part explain geographical distribution and diversity in conifers (Miksche, 1968). Intraspecific variations of DNA per cell was established in germinating seeds of *Picea glauca*, *P. sitchensis*, *Pinus banksiana* and *P. resinosa* from different geographical origins. The said variations might be due to plasticity resulting from changing environmental stress over the natural range (Miksche, 1968; Dhir and Miksche,

1974). On the other hand, from a survey of 26 provenances, covering almost the entire range of White Spruce in North America, Toek and Rees (1976) reported no significant variation in nuclear DNA amounts within the species except for a minor fluctuations due to B chromosomes. Dhillon et al. (1978) also reported that five populations of *Pinus rigida* growing in contrasting ecological situations ranging from North Carolina (35°53'N latitude) to Quebec (45°06'N latitude) showed no significant variation in amounts of nuclear DNA with respect to germinating seeds. Since different populations of the same species have homogeneous DNA content, the changes may probably exist at the base composition, redundancy, mRNA transcripts and 'gene products' the enzymes and proteins.

Pinus kesiya is an early successional species in the sub-tropics of Khasi Hills, growing in and around Shillong (25°40'N latitude and 91°35'E longitude) from an altitude of 800 m to 2100 m. The present study is an attempt to understand and correlate various differences at biomolecular level to adaptations within *P. kesiya* populations growing at Umshaw (900 m), Shillong (1400 m) and Upper Shillong (1900 m). The three localities vary in their temperature and rainfall throughout the year. The pine trees growing at low altitude in Umshaw show poor and

slender growth as compared to high altitude pines. The seeds obtained from Shillong and Upper Shillong forests showed better germination as compared to Umshaw collections. The amount of total protein in the three samples was same in the seed lots and it increased equally during germination. On comparing the electrophoretic patterns of proteins, a similar picture was observed in the seed lots of the three types except for two bands that were different. On the first day of germination, two new protein bands appeared in all the cases. Of these, one band having different Rm in each case might be due to altitudinal effect. The appearance of one new band on the 10th day in Upper Shillong collections and its absence in others, may also be due to high altitude effects stored in seeds and got expressed during germination.

In the three samples, the specific activities of peroxidase and also of α -amylase were almost similar in the seed lots and they increased with germination and growth. The total water soluble carbohydrates decreased upto 10th day and subsequently increased. There were four isoperoxidative bands in each sample, but with different Rm values. On the first day of germination, five new bands appeared in the Umshaw and Shillong collections, while only three were localized

in the Upper Shillong collections. These new bands, but for one, showed different Rm values in these collections. During subsequent growth, two new bands appeared in Shillong and Upper Shillong samples on the 10th day.

In the seed lots, two α -amylase isozyme bands in Umshaw and three each in Shillong and Upper Shillong populations were recorded. Of these, two isozymes were identical. On the first day of germination, two new bands in Umshaw and one new band in Shillong samples were observed. There also appeared a new band in Umshaw and Upper Shillong samples on the 10th and 15th day of germination, respectively. The total number of bands decreased in Shillong and Upper Shillong samples on the 20th day of germination.

In our earlier study, quantitative and qualitative variations in structural proteins and peroxidase and esterase activities and isozyme patterns were found associated with altitudinal variations in *P. kesiya* (Kohli and Tandon, 1982). A conclusion can be drawn from the present studies that the changes in electrophoretic patterns of functional 'gene products' might confer adaptability to *P. kesiya* populations growing at different altitudes in Meghalaya.

References

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