Ratio of Fusiform and Ray Initials in *Salix alba* L. from Temperate Climate of Kashmir Himalaya

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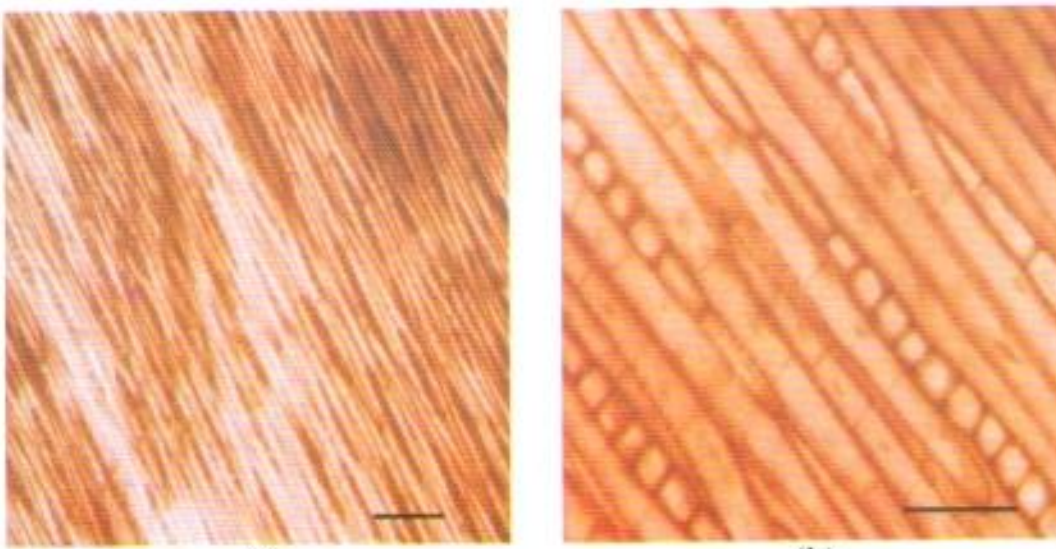
Woody trees possess a power of secondary growth by which they increase in girth. This activity of secondary growth results in the formation of wood which by nature is secondary xylem constituting vessels, fibers, rays, parenchyma etc. All these structures are formed by a mersitem called vascular cambium which is made up of two types of cells, called as fusiform and ray initials. The fusiform initials give rise to vertically oriented structures while ray initials give rise to horizontally oriented structures. It is believed that fusiform initials constitute more than 90% of the vascular cambium (Bailey, 1923; Butterfield, 1972, Kozlowski, 1971; Margaris and Papadogianni, 1977 and Wilson, 1964). However some recent studies of Ghouse and Hashmi (1979), Khan *et al.* (1979), Khan and Siddiqui (1980), Bhat and Siddiqui (2007), and Wani and Khan (2008, 2009) have shown that fusiform initials do not necessarily form more than 90% of the vascular cambium, while in *Dillenia indica*, Ghouse and Yunus (1974) noted that the tangential area of fusiform initials is as low as 25%. Keeping in the view the above observations, the present work was undertaken with an aim to find out the proportion of the fusiform and ray initials in the cambial zone of the main stem of *Salix alba* L.

It is a fast-growing species able to grow on various types of soils, even compacted, swampy, acidic or alkaline, provided roots have sufficient moisture. It is suitable for the biological control of soil erosion, siltation, nutrient cycling, phytoremedation, carbon sequestration and filtering of sewage and polluted water. White willow and several closely related species have been used for thousands of years to relieve joint pain and manage fevers. The bark is anodyne, antiinflammatory, antiperiodic, antiseptic, astringent, diaphoretic, diuretic, febrifuge, hypnotic, sedative and tonic. The wood of Salix is suitable for veneer, pulp, plywood, laminated wood, reconstituted wood products, artificial limbs, fruit boxes, agriculture implements, furniture; tool handles and sports goods like cricket bat, polo balls.

Cambial strips along with some sapwood and bark of 1-2 cm 2 size were

collected (20 samples) from the main trunk of *Salix alba* trees. Samples were fixed on the spot in Formalin – Aceto Alcohol (F.A.A) and then transferred to 70% ethanol after 72 hours of preservation. Samples were sectioned in tangential plane at a thickness of 10-15 µm. Sections were stained in tannic acid ferric chloride (Foster, 1934) and mounted in Canada balsam after dehydration in ethanol series. Camera Lucida drawings were made, of all the portions containing fusiform initials and weighed. The portions containing ray initials (after removing of fusiform initials) were weighed separately. The weighing was done on sensitive digital balance. The amounts of fusiform initials in the vascular cambium per unit area were calculated on the basis of the weights thus obtained.

The vascular cambium, in the *Salix alba* is composed of elongated, spindle shaped fusiform initials and almost isodiametric short ray initials aggregated to form ray initial unit of different height and width. The tapering ends of vertically aligned fusiform initials overlap each other to a considerable extent to make the cambium non-stratified. Analysis of data obtained revealed that the fusiform cells constitute 73% of the initials in the tangential area in cambial zone, while ray initials make up 27%, mean tangential area of the total cambial zone (Fig. 1 a and b).



(a) (b)

Fig. 1. T.L.S (a and b) showing fusiform and ray initials in *Salix alba* with non- stratified cambium at X 10 and 40X respectively. Scale bar Fig a = 40 µm, Fig b = 50 µm

In no case, the fusiform initials were found to constitute 90% or more as reported by earlier workers in certain conifers and dicotyledons (Butterfield, 1972; Kozlowski, 1971 and Wilson, 1964). Thus the present findings go in agreement with the observations of Ghouse and Yunus (1974), Ghouse and Hashimi (1977), Khan and Siddiqui (1980) and Wani and Khan (2008, 2009)

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