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(II)

MANAGING THE FLYING COTTON RELEASED BY POPLAR TREES IN KASHMIR PROVINCE OF WESTERN HIMALAYAS

Origin of the problem

Populus, a bewildering genus of ancient origin, results in the production of new species through cross fertilization. The populus belongs to family *Salicaceae* is usually dioecious and seeds are wind pollinated. The seeds bear tufts of whitish hair so these trees are commonly known as Cotton Wood or Aspen. Poplars make appreciable and significant contribution to the landscape and economy of the Kashmir valley. This region is bestowed with six important poplar species namely *populus alba* (White Poplar), *Populus tremula* (Aspen), *Populus nigra* (Black poplar), populus *deltoides* (Eastern cotton wood), *Populus ciliata* (Jungli fras) and *Populus caspica* (Dudh fras). *Populus nigra* and *Populus deltoides* are most commonly planted Poplars in Kashmir region. Poplars are known for their fast growth, easy vegetative propagation and give high production (10 to 30m^3/ha/annum) on short rotation of 8 to 12 years. In the present scenario, the poplar plants became the means of life to rural Kashmir. Poplar is dioecious (having separate sexes) and both the sexes produce flowers but female tree produces fruits which lead to the seed production. Seed production starts when the tree attains the age of 5 to 10 years in general. However, it is reported that the said age is extended to 10 years in Kashmir due to low temperate conditions. The amount of seed production is found to increase rapidly as the tree becomes older and larger. A single full grown poplar tree is found to produce as high as 48 million seeds and in one kg there are 7, 70,000 cleaned seeds. Therefore, one can imagine that how much cotton is produced during the seed dispersal in the region.

The polar clones were introduced to India in 1952 to increase the availability of wood for match box and ply wood industries. Clones namely G-3, G-48, D-100, D-121, WSL-22, L-34/82, L-49, S7C15 and S7C8 are the main part of the Poplar planting program which has spread to farm lands in the form of agroforestry and/or trees outside the forests (ToFs). One million families rely on poplar cultivation for their livelihood in northern parts of the country. The 80 per cent cultivated poplars are being utilized in plywood and veneer industries and rest is used for match box industries. The total area under poplar cultivation in India is 3,12,000 hectares (NPC, 2012). Forest Survey of India first time reported the inventory of 7,58,07,000 number of poplar stems which collectively represent 1.50 per cent of total stems recorded as ToFs (trees outside the forests) in the country. Uttar Pradesh is the leading state for growing 38.61 per cent of total Poplar in the country followed by Punjab (18.01%), Uttarakhand (16.95%), Haryana (16.33%), Jammu & Kashmir (3.85%), Himachal Pradesh (2.49%) and other with collective share less than 5 per cent. It is reported that there are 1,52,24,845 poplar stems which accounts 18.00 per cent of the total stems by total tree species in Jammu and Kashmir.

During 1980s, massive plantation of poplar imported from USA was done to boost the economy of the region besides, the meeting out the demand of fruit boxes. Poplar was planted on road sides, boundary of the agricultural fields, parks, orchards, home gardens and in the demarcated forests in the province. The literature supported that the systematic poplar plantations was started in 1982 with the launching of Social Forestry Project (SFP) by J&K State Forest Department. In total, 4,373 lacs of poplar plants have been planted by Social Forestry Department other than the private nursery growers. This was done without paying any heed for the identification of suitable clones and other related problems in the times to come. This all lead to problem of flying cotton in the prevailing time in the region. Moreover, the vegetative propagation of specific poplar clone especially female cultivars aggravated the problem and causing the threat of air pollution to local populace. The disseminated seeds tufted in cottony mass resulted in menace of creating number of respiratory disorders and other allergic ailments. The fluppy substance or seeds tufted in cottony mass is the product of Poplar trees and carries various allergy causing pollens of *Robinia pseudoacacia* (Kikar), *Juglance regia* (Walnut) and *Fraxinus* spp. (Ash). It is also responsible for carrying the spores of certain fungi that trapped in the cottony mass and spreading the disease after reaching the suitable host. Flying cotton causes visual disturbances and irritation to eyes, nose and throat. The life becomes miserable during the period of poplar seed dispersal i.e. mid of April to end of May. The pollens of *Populus deltoides* are reported to cause asthma and allergic rhinitis is supported by the studies conducted by White et. *al*. (2005)

Management

The nuisance caused by the falling cotton from poplar trees is the concern of each and every individual

inhabiting the Kashmir region. Poplar trees are the significant component of the landscape of the Kashmir and moreover trees have the essence to give the answer to the problem of climate changes. Therefore, there is need to address the problem in a way so that the local environment may not get effected besides, the safe guarding of the local populace economically and socially. The problem of flying cotton can be managed through systematic research and by adopting short and long term strategies. Some of these strategic remedial measures are enlisted as below:

- The female cultivars existing in the region should be felled and replaced with male cultivars, immediately.

Removal of female trees in a phased manner over a period of time will help to curb the menace of flying cotton. The other side of the coin is that the female cultivars add up 30 per cent more biomass than male cultivars in a same period. So, there will be compromise on production side if the female cultivars are to be removed from the region. It is advisable to have the option of male and female cultivars as per the plantation site and objective. The poplar trees are growing along the roads in particular NH-1A giving the shape of green tunnel and the attraction for tourists. On such sites, male cultivars may be preferred for planting. On contrary to this, female cultivars should be planted where biomass is the prime concern may be in block form or boundary plantations. The female cultivars should be planted in such a way that these are to be felled before they come to seeding.

- Discouraging the plantation of exotic poplars is another way to manage the problem.

Native poplars like *Populus ciliata* and *Populus balsemifera* should be encouraged to get rid of cotton floss. Both male and female cultivars are there in the valley. It is true that they grow slow but their growth can be improved through selection and silvicultural interventions.

- Lopping of female trees should be a routine feature as upper branches produced more seeds than the lower branches to minimize the dehiscence quantum.

It is advisable for poplar growers that they should lop the upper and middle branches before the fruit formation i.e. in the month of February and March.

- Improved poplar male clones suitable to the local conditions may be identified for future plantation programe.

The government agencies namely J&K State Forest Department and Sher-e-Kashmir University of Agricultural sciences and Technology of Kashmir (SKUAST-K) are in process for screening the male clones procured from WIMCO Seedlings Pvt. Ltd., Rudarpur, Uttarakhand, FRI, Dehradun, Uttarakhand and Punjab Agriculture University, Ludhiana, Punjab (PAU) for their adaptability and growth in local temperate conditions and for further future plantation programs. The main poplar male clones under testing are UDAI, WIMCO-81, D-121, DN-34, DN-5236 etc.

- There is need for establishment of populatum of identified, efficient and well adapted male/ female cultivars which have less and no cotton will lead to more economic and environmental security.

The native species have been reported to produce less quantity of cotton and better adapted to the local conditions with only one drawback of slow growth than the exotic poplars. The poplar species native and/or exotic grown in the populatum may be compared for their growth and seed production with the sole objective to have the less or cotton free cultivars in the valley.

- The private growers involved in the production of poplar planting material should be under gone the process of certification of the produced material.

This certification can be done by the J&K State Forest Department and Faculty of Forestry, SKUAST of Kashmir to stop the further multiplication of female cultivars of poplar in the region.

- Proper ratio of male and female cultivars should be maintained to have less cottony mass in the environment.

If this version of management of flying cotton is kept then there is fear that in the times to come the disseminated seeds will be fertile and will have more number of saplings in the paddy fields. This will result in new nuisance to the agricultural fields in the region.

- Need for developing the identification index with the help of molecular studies at seedling stage under nursery conditions to know the sex of the sapling.

It is impossible to differentiate the sex of the cultivars except in the flowering season in poplar plantations and nursery. This can be possible after developing the specific molecular marker (SCAR) for identification of elite cotton free poplar cultivars from existing population of poplar trees in the Kashmir valley. Male and female cultivars can be identified throughout the year by using the index developed from the linkages between morphology and molecular markers of the poplar plants. This may prove to be the best option to

control the nuisance of flying cotton in the region.

- The state government should formulate a bill to regulate the removal of female cultivars in a phased manner to overcome the prevailing problem.

There is dire need to formulate a bill for removal of poplar trees on farm lands in phased manner after fixing the maximum exploitable diameter up to which trees can be retained by private growers to reduce the intensity of cotton menace. The local masses should be guided that they are not suppose to plant poplar trees especially female cultivars in and around the residential areas as this is common practice in many countries like China where female cultivars are planted 30 km^2 away from the habitation.

At the end, there is need to educate the populace for planting poplar trees as per objectives of plantation, balanced ratio of male and female cultivars, adopting the lopping practices, etc. to minimize the cotton menace. Moreover, female cultivars should be felled before it starts flowering and seeding. There is also need for doing the research to have the exact exploitable diameter corresponding to the age and development of identification index with molecular studies to answer the prevailing problem in an ecological and economical way.

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