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Research Article

STATUS AND DISTRIBUTION OF BOXELDER (*ACER NEGUNDO* L.) IN KASHMIR VALLEY

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ABSTRACT
The present study was undertaken in the Faculty of Forestry, SKUAST-K and Shalimar during the year 2010-2011. To appraise its status and distribution, a project entitled "Status and distribution of Boxelder (*Acer negundo* L.) in Kashmir valley" was undertaken. A detailed survey regarding the species revealed that among the Acer species, the *Acer negundo* is an exotic one from North America and is confined to the lower planes of Valley mainly in gardens and parks as an ornamental and avenue plantation tree. As per the study conducted regarding the tree species, it has been found that the concentration of the species is high in the Srinager district due to presence of large number of gardens and parks. The survey revealed that old existing trees were located in the Bakshi Stadium. The species being recently introduced in the valley in 1970's by Floriculture and Landscaping Department, J&K at protected sites of Bakshi Stadium, Botanical Garden (Cheshmashahi), University of Kashmir etc. and is not much popularized among common masses, hence not given any vernacular/local name and is called by name *Acer*. Among 10 districts of the valley, the tree species was not found in district Ganderbal, Kulgam and Shopian.

Key Words: *Boxelder, Status, Distribution, Kashmir Valley.*

INTRODUCTION

The state of Jammu and Kashmir, the western extremity of the Himalayan mountain chain is the home of best natural temperate coniferous and broad leaved tree species. The evergreen forests of J&K comprises mostly of *Cedrus deodara* (Deodar), *Pinus wallichiana* (Kail), *Abies pindrow* (Silver fir), *Pinus roxburghii* (Chir pine) etc. while as deciduous forests comprise of *Populus* species (poplars), *Aesculus indica* (Indian horse chestnut), *Salix* spp (willows), *Robinia pseudoacacia* (Black locust), *Celtis australis* (Heckberry), *Juglans regia* (walnut), *Ulmus wallichiana* (elm), *Fraxinus floribunda* (Ash tree) etc.

Boxelder commonly known as *Acer negundo* is one of the most widespread and best known of maples. Its other common names include Ash leaf maple, Boxelder maple, Manitoba maple, California Boxelder and Western Boxelder. Best development of the species is in the bottomland hardwood stands in the lower Ohio and Mississippi River valleys, although it is of limited commercial importance there. Its greatest value may be in shelterbelt and street plantings in the Great Plains and the west where it is used because of its drought and cold resistance. It is found in variety of soil types, growing best in lowland sites along rivers, streams, ponds or seasonally flooded flats (Elias, 1980).

Boxelder is the most widely distributed of all the North American maples, ranging from coast to coast and from Canada to Guatemala. In the United States, it is found from New York to Central Florida; West to Southern Texas; and northwest through the plains region to eastern Alberta, central Saskatchewan and Manitoba; and east in southern Ontario. Boxelder has been naturalized

in New England, southern Quebec, New Brunswick, Nova Scotia, and Prince Edward Island; and in the Pacific Northwest in South eastern Washington and eastern Oregon (Overton, 1983).

Amongst deciduous tree species of Kashmir one of the important unevenly distributed species is *Acer negundo* commonly known as Boxelder, which belongs to family *Aceraceae* or maple family and has its origin in North America. This family consists of two genera and about 120 species of trees and shrubs. The genus *Acer* Linn is found in the Himalayas but the genus Dipteronia olive does not occur in India. The other most important and characteristic species of this maple family include *Acer acuminatum, Acer caudatum, Acer laevigatum, Acer nievium, Acer sikkimense, Acer caesium, Acer campellii*, etc.

The edible parts of the *Acer negundo* are inner bark, leaves, sap and seed. Sap is used as a sweetener. The sap contains a reasonable quantity of sugar and can be used as a refreshing drink or can be concentrated into syrup (Bean, 1981). The sugar from the sap of this tree is said to be white than that from other maples (Facciola, 1990). The best sap production comes from cold-winter areas with continental climates. Inner bark (raw or crooked) it can be dried, ground into a powder and then used as a thickener in soups etc. or be added to cereal flours when making bread, cakes, etc. (Moerman, 1998). Self-sown seedlings, gathered in early spring, are eaten fresh or dried for later use (Weiner, 1980). The wings of seeds are removed and the seeds boiled then eaten rot (Weiner, 1980). A tea made from the inner bark of this species is used as an emetic (Foster and Duke, 1990). The other uses of the species are as musical, preservative, shelterbelt, wood. The leaves are packed around apples, root crops etc. to help preserve them (Philbrick and Gregg, 1979). A fairly wind tolerant tree, it can be used in mixed planting as a part of shelterbelt plantings (Huxley, 1992). It weighs 27 lb per cubic foot (Britton and Brown, 1970).

Unfortunately, this species has not received any attention so far. Extensive plantation of this species is not found. No information is available with respect to its status and distribution in Kashmir valley, therefore, in order to collect some basic information with respect to its status, distribution a project entitled "Status and Propagation of Boxelder (*Acer negundo* L.) in Kashmir Valley" has been under taken .

MATERIALS AND METHODS

The investigation entitled "Status and distribution of *Acer negundo* (Boxelder) in Kashmir valley" was conducted in Faculty of Forestry, Sher-e-Kashmir University of Agricultural Sciences & Technology of Kashmir, Shalimar (Srinagar), during the year 2010-11. A detailed account of the techniques followed and materials used during the conduct of the research work is presented below:

Experimental site: location, physiography and climate

The state of Jammu & Kashmir is strategically located in the North West corner of India. It shares its borders with China in the East, Pakistan in the West, Afghanistan and Russia in the north and plains of Punjab and Himachal in the south and south-east. The state of Jammu and Kashmir stretches between 32^{o} 17'N to 37^{o} 05' North latitude and 72^{o} 31'E to 80^{o}20' East longitude. From North to South, it extends over 640 Km in length and from East to West over 480 Km in breadth. On the basis of physiographic conditions and climate, the present Jammu and Kashmir State has been divided into five natural regions or macro regions like Outer Plains, Outer Hills, Middle Mountains (Pir Panjal), valley of Kashmir and Greater Himalayas of Ladakh region.

The valley of Kashmir lies between inner Himalayan range of east, comprising of the Nanga Parbat and the outer Himalayan range to the west and south called the Pir Panjal. This valley is bounded on the north by the Karakoram Range, on the north east by Ladakh and on the south by Jammu. Srinagar is the summer capital of the state stands by river Jhelum that forms the lifeline of Kashmir valley. Kashmir valley is located in the North-western extremity of India between 32^{o}-17' and 38^{o}-58' north latitude and 73^{o}-35' and 80^{o} 36' east longitude. The average altitude of Kashmir valley ranges between1500-2300 metre above mean sea level. The area has temperate type of climate where winter is severe extending from December to March. The region faces a wide temperature range from minimum of -8^{o}C in winter to a maximum of 33^{o}C in the summers. Snowfall takes place during winter months and area receives an annual precipitation ranging from 676-1193 mm.

Thus the above research was carried out through detailed survey at block level of all the districts of Kashmir valley and observations with regard to status, distribution, concentration and identification of existing *Acer negundo* trees in the area was recorded. Besides, information was also collected for its socio-economic impact as per Annexure-I.

Annexure-I

1. District Block Panchayat Village/ Site

2. Name of household with parentage
3. Total land holding of household
4. Income of household from land holdings
5. Do you grow Boxelder (*Acer negundo)* (Yes/No)
6. No. of Boxelder trees owned
7. Type of plantation (Block/ Boundary/Canal, etc.)
8. Purpose of growing Boxelder trees (commercial/household/other)
9. Approximate income generated from tree
10. Any problem in growing boxelder tree?
11. Do you want to grow more of these trees?
12. Any information pertaining to boxelder during the course of survey

The information was collected from surveyed areas through following methods:

a) Schedule Method: A Schedule prepared for the purpose was filled on the spot during interaction with farmers. Schedule consisted of both open and close ended questions (Annexure-I).

b) Informal interview Method: Information was also collected during informal interviews with the farmers, oldest and respectable citizens of the concerned areas. Generally open-ended questions were asked for getting the information.

c) Transit walk Method: Information was collected during transit walk of the villages. Transit walk gave more space to discuss with farmers freely in their lands while walking through their farms. Problems and prospects of agro forestry farming were discussed.

Identification of old living box-elder trees

While conducting detailed survey information with respect to old living trees in the valley was also collected. The trees identified were studied for their location, approximate age, height and girth at breast height. The approximate age was determined by interviewing the senior residents of the locality. The height of the trees was determined by the aid of altimeter and girth was recorded by ordinary measuring tape. Photographs of all the identified trees were also taken.

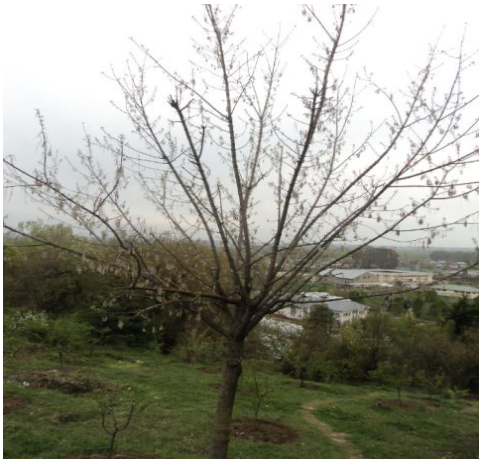
RESULTS AND DISCUSSION

Species identification

Detailed survey conducted regarding the species *Acer negundo* throughout the Kashmir valley. The phenotypical & phenological observations thus recorded revealed that it is usually a medium sized tree up to 12-14 m in height in temperate conditions of Kashmir valley (Plate-1). It has also been reported that the tree can go upto the height of 21- 25 m and diameter upto 90-100 cm in its primary range (Hosie, 1969) and in its invasive range (Zaleska, 1958; Seneta, 1991). Its architecture depends heavily on the habitat conditions. It is a deciduous tree with pinnately compound leaves. It flowers from last week of March to 2nd week of April and seed ripens from 2nd week of September to last week of October. While all the maples have opposite leaves, and for a number of them the leaves are composed of small leaflets. It is usually a fast growing species. Young stems have green bark, often covered with "a whitish wax bloom" or hairs (figure 1). The phenological features of the species (*Acer negundo* L.) are shown in figure 2.

Status and distribution: The objective was achieved by conducting an extensive survey at village level (Panchayat level) of all the districts of Kashmir valley and observations were taken from 640 sites with regard to its status, distribution and concentration (Table 1). The survey conducted at the sites revealed that the tree species is usually found in the plain areas, mainly in gardens, parks, river/stream banks, roadside, avenue plantation etc. Being non-palatable leaves the tree species is not planted for fodder purposes. The survey also revealed that no tree was located in sampling area on the farm lands (Agricultural lands). Therefore the socio-economic evaluation of the *Acer negundo* could not be evaluated; this indicated that tree is not raised as an agro forestry tree species by the farmers of the valley.

Figure 1: Boxelder (*Acer negundo* L.) located at Botanical Garden, Cheshmashahi and Srinagar



Deciduous Habit

Bark Light Brown

Pinnately compound leaves

Seed colour (light brown)

Male inflorescence

Female inflorescence

Figure 2: Phenological characterеistics of Boxelder (*Acer negundo* L.)

While conducting survey it was learnt that the tree was growing on non-agricultural lands, such as parks, gardens, avenue tree, on village common lands, road side plantation etc. therefore, an attempt was made to collect the necessary information from such spots. The information collected regarding the survey is shown in Table.1. The data revealed that the tree is not found in all the districts of Kashmir valley. The species was found in abundance in the Srinagar city (116) due to presence of large number of gardens and parks. After Srinagar, the concentration is greater in Baramulla (19) followed by Bandipora (11) and Budgam (10). The least number of trees was found in district Kupwara (4). In case of district Kulgam, Shopian and Ganderbal, none of the trees was found (Table-1).

Identification of old living Boxelder* (*Acer negundo*) *tree

The information with respect to the old existing living Boxelder trees in Kashmir valley was collected while conducting interview with forest officials, respectable senior and old citizens of the concerned areas and during the transit walk of villages surveyed. The observations recorded showed that good number of old existing trees. In case of district Srinagar, highest number of trees was located in Bakshi Stadium (30) as shown in Table-1. The old existing trees in case of Srinagar were also located from the same place. In Srinagar, having maximum concentration of the species, the average height and diameter recorded was 13.2 m and 88.6 cm, respectively as shown in. The location of other older trees was Botanical Garden (Cheshmashahi), Darul-Uloom Raheemia (Bandipora), University of Kashmir (Hazratbal) etc. as illustrated in figure 3.

Table 1: Distribution of *Acer negundo* trees in various districts in Kashmir valley

S. No.	District	No. of trees found	Average height (m)	Average girth (cm)	Location of old tree
1.	Srinagar	116	13.2	88.6	Bakshi Stadium
2.	Baramulla	19	11.3	73.4	FOA Wadura, Sopore
3.	Anantanag	9	9.7	69.3	Govt. Degree collage Khanabal
4.	Pulwama	7	6.8	56.4	Govt. Degree collage Pulwama
5.	Budgam	10	7.2	61.8	Govt. Hr. Sec. School Nagam
6.	Bandipora	11	10.6	71.3	Darul-Uloom Rehemia
7.	Kupwara	4	6.3	59.2	Near Kamraj DFO office Kupwara
8.	Ganderbal	-	-	-	-
9.	Kulgam	-	-	-	-
10	Shopian	-	-	-	-

Tree located at Bakshi Stadium Srinagar

Tree located at Darul-Uloom Raheemia, Bandipora

Tree located at Botanical Garden Srinagar

Tree located at Kashmir University Hazratbal

Figure 3: Old aged *Acer negundo* L. trees found at various locations in Kashmir valley

Species Identification

Extensive survey conducted of the sites chosen (640) for the survey from all the districts of the valley revealed that about 176 Boxelder trees was found growing in the valley (Table-1). The tree is medium to large sized and having height of about 12-14 m at the time of maturity. The canopy is symmetrical with regular (or smooth) outline and individuals have more or less identical crown forms. The crown shape is round. The bark is greenish brown at early stages and later changes to light brown when it proceeds towards maturity. The arrangement of leaves is opposite/sub-opposite; leaves are pinnately compound, leaf margins lobed, lanceolate or ovate leaf shape and reticulate venation. The leaves do not persist throughout, so the plant is deciduous. The phenological observations recorded revealed that the flowering initiation starts from last week of March and remains upto April. The flower colour is white, inconspicuous and not showy. The seed ripening starts from 2nd week of September and lasts till end of the October. The seed dispersal starts from October onwards and lasts till March. The seeds remain on the

plant during winter period as well. The Phenological observations recorded revealed that the tree species (*Acer negundo* L.) was same as described by Olson and Gabriel (1974) and Dirr (1990).

Status and distribution

During the course of survey, observations with respect to its status, distribution, concentration and identification of old existing Boxelder trees in the area were also recorded. The species was found to be growing mainly in parks and gardens. That is why the concentration of this species was more in district Srinagar. Large numbers of trees are found in Botanical Garden Chashmashahi, Nishat garden, Shalimar garden, city parks like Iqbal park, etc. In Downtown area of Srinagar, the species was mainly planted by Department of Social Forestry on roadsides and riverbanks. The areas of other districts from where the species of Boxelder was located were; Botanical garden (Govt. Degree College, Anantnag), Kokernag (Anantnag), Achabal (Anantnag), DFO Office (Anantnag), Kashmir Forest Training Institute (KFT), Chatternar (Bandipora), Gulnar Park (Baramulla), DFO Office Social Forestry (Baramulla), Akkad park (Anantnag). At the higher altitudes, mainly in district Shopian, Tral and Kelar Block of Pulwama, other species of this genus, namely *Acer caesium* (Kensal) was mainly found. In higher reaches of district Shopian in Harpora village, the concentration of *Acer caesium* was more and having economic value due to fodder and other utility in agricultural implements.

During the survey conducted, it was found that the oldest existing trees of this species (*Acer negundo*) were found in Bakshi stadium, Srinagar. According to the information collected from sources/management authority of the stadium, these trees were planted in the year 1971 and the number of trees at present in the stadium was 30. For research purpose, the species was also kept in the Botanical Garden of University of Kashmir and Faculty of Forestry, SKUAST-K, Shalimar, Srinagar. The tree was also found on the river banks of Jhelum in the area of Rajbagh (Srinagar), Pampore (Pulwama), Awantipora (Pulwama) and Panthachowk (Srinagar). Thus it has been concluded from survey that the concentration of this species in abundance is mainly in Srinagar, followed by Baramulla and Bandipora. The area having least concentration with only four plants is district Kupwara. One of the reasons for its low concentration in valley is due to its small timber value and other utilities. The districts where none of the tree was found growing are Ganderbal, Shopian and Kulgam.

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