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Research Article

A REPORT ON THE IMPACT OF *BROUSSONETIA PAPYRIFERA* (L.) VENT. AS INVASIVE ALIEN PLANT IN RAJOURI DISTRICT OF JAMMU AND KASHMIR

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ABSTRACT

The spread of invasive species is now recognised as one of the greatest threats to our planet's environmental and economic well-being. The integrity of natural ecological systems worldwide is increasingly being jeopardised due to large - scale introductions of alien plants, animals and micro-organisms. The present study aims to deal with impact of *Broussonetia papyrifera* (L.) Vent. as invasive alien plants species of family Moraceae in Rajouri district (J&K, India) with background information on habit and nativity. The result reveals that this species has been introduced by wind agency and also unintentionally by birds, bats and mammals there is utmost need of proper methods for early detection to control and reporting of infestations of spread of new and naturalized weeds.

INTRODUCTION

Invasive species refers to those species, which establish themselves in an area outside their natural range, exponentially increase their population, thus outcompeting the native species of that area and usually bring changes in the function of ecosystem. Ecologically each species occupies a niche in the ecosystem. According to Gause's competitive exclusion principle, the two species occupying the same niche cannot survive simultaneously forever. The more aggressive one thrives and the poor competitor vanishes. Invasive plants lack natural predators in addition to their adaptive nature in alien environments. In many cases they have prolific reproduction, easy to pollinate, high seed output with staggered dormancy and in certain cases allellopathic in nature as well. They are a growing threat throughout the world, causing losses in biodiversity, changes in ecosystems and impacts to economic enterprises such as agriculture, forestry, fisheries, power production and international trade. Those alien species that become established in a new environment, then proliferate and spread in ways that are destructive to human interests are considered. Moreover some ecological disturbances like disease, fire and cleaning of land etc. made changes at micro and macro level, opened up niches for new alien and invasive weeds (Marwat *et al.*, 2004). The spread of invasive alien species is creating complex and far-reaching challenges that threaten both the natural biological riches of the earth and the well being of our people. While the problem is global, the nature and severity of the impacts on society, economic life, health and natural heritage are distributed unevenly across nations and regions. Some aspects of the global invasive alien species problem require solutions tailored to the specific values, needs and priorities of nations while others call for consolidated action by the larger world community. Preventing the international movement of invasive alien species and coordinating a timely and effective response to invasions requires cooperation and collaboration among governments, economic sectors, non-governmental organisations, and international treaty organisations. At the national level, consolidated and coordinated action is required. This could be part of a national biodiversity strategy and action plan, with close involvement of the economic sectors and identifying people responsible for operative actions involving potential invasive alien species as a key prerequisite. Clear responsibilities for each relevant sector would need to be identified.

The present study aims to act as a foundation stone for the advanced studies in invasion ecology and biology and would serve a benchmark for future assessment of extent of invasion

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not only in this biodiversity rich region of J&K state but also the rest of the country.

MATERIALS AND METHODS

Study Area

The present work is carried by the author in the Rajouri district of which is situated in the west of Jammu division. It is bounded by Poonch district in the north, Jammu district in the south, Udhampur district in the east and Pak occupied Kashmir (Mirpur area) in the west. It is located in the foothills of Pir Panjal Range. The general elevation of the district is in the range of 562-4800 m above mean sea level. Rajouri is the district headquarter, which is 160 km from Jammu, the winter capital of Jammu and Kashmir. This part of Jammu region encompasses extraordinary biotic communities which is attracting people from different regions and is being promoted as a tourist destination.

With the operationalization of improved roads and highways and better connectivity, the influx of traders, tourists, businessmen has increased manifold, thereby raising the threat of invasive alien species even more into this Pir Panjal range.

The main objectives of the present study are

1. Documentation and inventorisation of the alien flora of Rajouri district.
2. To record their origin, spread, introduction pathway and invasion status.
3. To spread public awareness on the impact of invasive alien species on environment and economy.

Extensive survey was carried out in Rajouri district during 2012 -2013. The field studies for documenting the spread of invasive alien species of family Moraceae in Rajouri district of Jammu Division were conducted in all the seven tehsils of the district viz. Rajouri, Nowshera, Kalakote, Sunderbani, Koteranka, Thannamandi and Darhal.

The present investigation aims to identify and document the *Broussonetia papyrifera* (L.) Vent. as invasive alien species present in the Rajouri district of the Jammu region of J&K state. During the course of field study the authors have selected different tehsils and blocks of Rajouri district viz; Rajouri, Nowshera, Kalakote, Sunderbani, Budhal, Thannamandi, Darhal, Koteranka and Manjakote and the following steps were followed : visit to study sites, sample collection, preservation and identification. During this period enquiries were conducted from farmers and agriculturalists of each site about the invasive biota. Every site was divided into different land use types, and the division was made as follows : agricultural fields, forest areas, roadsides, fallow land, along the banks of water bodies, residential areas, low land, water bodies, waste lands, etc.

Each study site was intensively sampled for the invasive species, their numbers and other characters. The survey and data collection on the invasive alien species of Rajouri district followed a random sampling method so that no bias is introduced. The field books were maintained to record the following information: collection number, date of collection, local name, family, habit, habitat and impacts. This species was collected systematically, preserved and stored for identification. Existing literature and information from web based data, online identification system and ISSG database were used to determine the alien origin of the species.

Survey and Collection: A comprehensive survey was conducted by the author in various locations in Rajouri district for *Broussonetia papyrifera* (L.) Vent. as invasive plant species. Periodic survey were conducted during premonsoon, monsoon and postmonsoon seasons. All the available plants of this species were recorded and collected. Observations were made regarding occurrence, distribution of this plant species, colonization modes and damage or changes to the ecosystem caused by the invasive plants. Field observations regarding individual plant species, site where it is growing and the potential damage it is causing to the ecosystem was recorded in the field notebook and photography of it was done with Sony Sony DSC-T20 digital still camera.

Preservation and Herbarium Records: The plant parts collected during every field trip were carried to the laboratory and were properly pressed, dried and properly preserved and herbarium sheets were made using conventional methods of processing and drying.

Identification: After an extensive review of literature on global invasive species (Mooney and Drake,1987; Heywood, 1989; Cox, 1999, 2004; Cracroft and Francesca, 1999; D'Antonio and Vitousek, 1992; Drake *et al.*,1989; Randall *et al.*,1997; Huxel,1999; Jenkins, 1999; Lonsdale, 1999; Mooney, 1999; Elton, 2000; Mooney and Hobbs, 2000; Almeilla and Freitas, 2001;Cowie, 2001; McNeely *et al.*, 2005) and of India and their spread based on history, species origin, species behaviour and field observations. Existing literature and information from web based data, online identification system and ISSG database were used to determine the alien origin of this species.

The specimens were mounted in the herbarium file of the size 41.5 cm x 28.5 cm along with photographs and deposited in the museum of the Department of Zoology, University of Jammu, Jammu. Each plant species was provided with its botanical name, author citation and brief morphological description. Besides, help from other agencies were also undertaken.

RESULTS AND DISCUSSION

There is an apparent need for a regional and national authentic database for monitoring the spread and impact in various regions and for devising appropriate management strategies. The present study records first ever database of the *Broussonetia papyrifera* (L.) Vent. belonging to family Mporaceae in Rajouri district of Jammu division of J&K state. However, many more species have also been recorded from different parts of Rajouri but their taxonomic status have so far not been determined. Efforts are on to get them identified and will be included in the database shortly. About 80% of these alien species were introduced from Europe, followed by North America.

Contemplating the importance of studies on invasive alien species, especially in the areas the of high anthropogenic interference, present study was aimed at compiling the first ever inventorisation of the alien flora of Rajouri district, along with supplementation of each species with information on origin, habit, spread, introduction pathway and the invasion status.

Broussonetia papyrifera (L.) Vent.

Order: Rosales ***Family:*** Moraceae

Common Name: Paper mulberry, Pulp mulberry, Dak and Tapacloth tree.

It is a deciduous tree with milky sap that grows to a height of about15 metres tall. Stem hairy; grows from stolons. The leaves are variable in shape, unlobed egg-shaped with broad end at base, heart-shaped to deeply lobed. Lobed leaves are more frequent on fast-growing young plants; they are 7–20 cm long, with a rough surface above, fuzzy-downy below and a finely serrated margin. The male flowers are produced in an oblong inflorescence and the female flowers in a globular inflorescence. In summer, the pistillate flower matures into a red to orange, sweet, juicy fruit 3–4 cm diameter, which is an important food for wild animals in its native range.

Habitat: These thrive in open habitats such as forest and field edges, roadsides and in disturbed areas. Floodplain forests and river terraces are especially prone to invasion by this tree species.

History of invasion: Paper mulberry is the most problematic invasive in northern Pakistan. It has the typical features of invasiveness by fast growth rate, seed dispersal through birds, and ability to vegetative propagation. Its fruits are relished by crows and other birds who thus acts as the vector for its seed dispersal; therefore both crows and paper Mulberry are promoting each other.

a highly invasive species in the natural ecosystem of Himalayan foothills. Around Rawal Lake it has replaced the entire natural vegetation (Marwat *et al.*, 2010).

Biology/Ecology

Dispersal Mechanism: It spreads both by seed and through vegetative expansion. The seeds are spread far and wide by wildlife who feed on the fruits. It expands locally by producing new plants from its roots.

Reproduction: This species reproduces by seeds and also vegetatively via numerous suckers produced from its shallow roots. Individual plants can also quickly develop into large colonies.

Distribution:

Native Range: It is native to Eastern Asia.

Introduced Range: It is widely naturalized in the United States, South America, Africa and Asia.

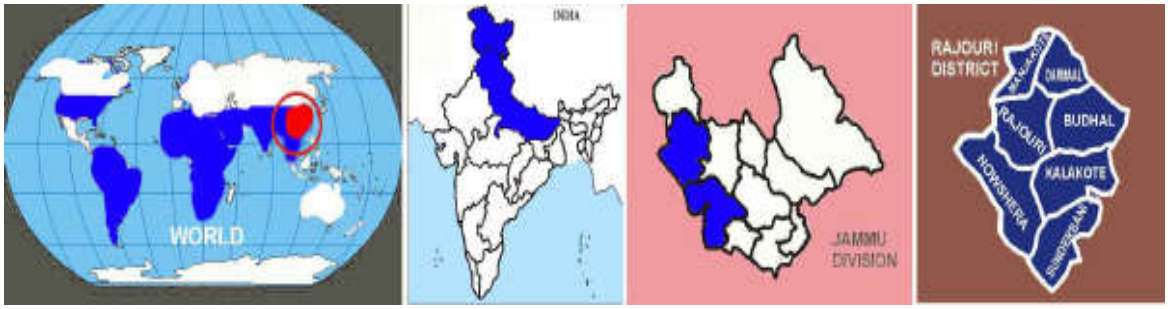
Distribution in India: Northern states.

Distribution in Jammu Division (Rajouri district): Widespread.

Introduction Pathway: Transportation, by wind agency and also by birds, bats and mammals.

Impact: This invasive tree species exhibits aggressive growth and quickly invades disturbed lands, competing with more

Figure 1 *Broussonetia papyrifera*



a) World **b) India** **c) Jammu division** **d)Rajouri district**

Figure 2 a-d Distribution (blue marked) and Native range (encircled).

the residents of affected areas. It was introduced in Islamabad to make capital green. In less than thirty years period it became

Figure 3 Spread in Rajouri district (Study area).

desirable plant species. When introduced to non-native areas, it can quickly disrupt the native habitat, especially on forest edges and in canopy gaps, becoming a highly invasive species and upsetting the natural ecosystem. It chokes out native flora because of its very high consumption of water, which leaves less water to sustain the native flora and also due to direct competition for nutrients, space and light. Its root system, while extensive, is shallow and is also prone to being blown down by high winds (Duke and Ayensu, 1985). When cut, the trees release a latex heavy sap which is extremely sticky and can ruin clothing. It is responsible for one of the highest pollen counts in the world which causes serious allergies resulting in deaths every year. It is also invading the Himalayas rapidly and replacing the native vegetation at an alarming rate.

Threat level: High.

CONCLUSION

In conclusion, our study indicates that such anthropogenic influences along with wanton axing of forests, unregulated grazing, pollution, climate change etc, have promoted invasion by non-native species. This invasive species is a growing threat to the natural vegetation of National park and other valleys in the East of Islamabad up to Jammu and Kashmir. Besides threatening the natural vegetation, it is also a human-health hazard.

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References

Almeilla, I.D. and Freitas, H. (2001). The exotic and invasive flora of Portugal. Bot Complutensis, 25:317-27.

Cox, G.W.(1999). Alien Species in North America and Hawaii: Impacts on Natural Ecosystems. Island Press, Washington, D.C.

Cox, G.W.(2004). Alien Species and Evolution: The Evolutionary Ecology of Exotic Plants, Animals, Microbes, and Interacting Native Species, Washington, D.C.

Cowie, R.H.(2001). Non-indigenous land and freshwater molluscs in the island of the Pacific: conservation impacts and threats. In G.Sherley (ed.) Invasive species in the Pacific: a technical review and regional stratergy. South Pacific Regional Environment Programme, Somoa: 143-172.

Cracroft, J. and Francesca, T. (1999). The living planet in crisis. Columbia University Press, New York.

D'Antonio, C. M. and Vitousek, P. M. (1992). Biological invasions by exotic grasses, the grass fire cycle, and global change. *Annual Review of Ecology and Systematics,* 23: 63-87.

Drake, J. A., Mooney, H. A., Di Castri, F., Groves, R. H., Kruger, F. J., Rajmanek, M. and Williamsons, M. (1989). Biological invasions: a global perspective. John Wiley and Sons. New York, 525 pp.

Duke, J. A. and Ayensu, E .S. (1985). Medicinal Plants of China Reference Publications, Inc.

Elton, C.S.(2000). The ecology of invasions of animals and plants. University of Chicago Press, Chicago,196pp.

Heywood,V.(1989). Patterns, Extents and Modes of Invasion by Terrestrial Plants. In: Drake,J,*et al*(eds.), Biological Invasions: A Global Perspective, Wiley, NY, 31-60.

Huxel, G.R. (1999). Rapid displacement of native species by invasive species: effects of hybridisation. Biological Conservation, 89:143-52.

Jenkins, P.T.(1999). Trade and exotic species introductions. In Sandlund, O.T., Schei,P. Invasive Species and

Biodiversity Management. Kluwer Academic Publishers, The Netherlands, 24:229-35.

Lonsdale, W.M. (1999). Global patterns of plant invasion and the concept of invisibility. Ecology, 80:1522-1536.

Marwat, K.B., Ibrar M and Hashim, S. (2004). Ethnobotanical study on weeds in district Abbottabad N-W Pakistan. *Acta Botanica Yunnanica*. XV:106-113.

Marwat K.B., Hashim S. and Ali H. (2010). Weed management: a case study from north-west Pakistan. *Pak. J. Bot*., 42: 341-353.

McNeely, J.A., Neville, H.A., Schei, L.E. and Waage, J.K. eds (2005). Global strategy on invasive alien species. Cambridge, UK: IUCN in collaboration with the Global Invasive Species Programme.

Mooney, H., and Drake, J.A.(1987). The ecology of biological invasions. Environment, 29(5) : 12.

Mooney, H.(1999). A global strategy for dealing with alien invasive species. Invasive Species and Biodiversity Management (eds. Sandlund, O.T., Schei, P.J., Viken, A.). Kluwer Academic Publishers, London, 407-418.

Mooney, H.A. and Hobbs, R.J.(2000). Invasive Species in a Changing World. Island Press. Washington, D.C., USA, 439 pp.

Randall, J.M., Rejmanek, M. and Marinelli, J.(1997). Invasive Plants: Weeds of the Global Garden. Brooklyn Botanic Garden, Brooklyn, New York,111pp.

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