Original scientific paper
10.7251/AGSY1404461B

DISTRIBUTION MAPPING OF JAPANESE KNOTWEED (*Fallopia Japonica* (Hout.) Ronse Decre.) IN NORTH WESTERN AREA OF REPUBLIC OF SRPSKA

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Abstract

One of the most invasive plant species in Europe, Japanese knotweed is also broadly regarded as one of the top one hundred invasive species of global concern. Considering factors such as climatic and soil conditions, Republic of Srpska is definitely one of the area for potential distribution of japanese knotweed. In this sense main goal of this study was to carry out distribution mapping of Japanese knotweed in north western part of Republic of Srpska (RS). Distribution and abundance parameters were done for 15 Fallopia stands based on Blanque Braun (1964) method and GIS software. A wide-spread distribituion reveal a high spreading and renewal potential of the species which turns it into a real threat to infrastructure, native flora and wildlife habitats, watercourses etc. By current research in the north western part of RS japanese knotweed is in significant expansion, resulting in negative ecological, economic and social impact. Regarding to those research priorization process for mentonied area on local level is of a great importance.

Key words: *Japanese knotweed, distribution, mapping, Republic of Srpska*

Introduction

Japanese knotweed is naturalised in many European countries (Sukopp and Sukopp, 1988), up to at least 68 degrees N latitude (Jalas and Suominen, 1979), and also in south European countries like Croatia, Macedonia, and Bosnia and Herzegovina (Trinajstic, 1990) (photo 1, http://www.cabi.org/isc/datasheet/23875). Also known as *Polygonum cuspidatum* or *Reynoutria japonica*, Japanese knotweed is a clonal, herbaceous, fast-growing perennial plant (Aguilera *et al*., 2010). Knotweeds are native to eastern Asia (Japan, Korea, northern China and Taiwan) (Pysek, 2006) whence they were introduced in the Unites States in the 1877s for ornamental purposes (Aguilera *et al*., 2010) and in Europe, starting with the Netherlands in 1823 followed by Germany in 1872, Poland in 1882, United Kingdom in 1886, Norway in 1901 etc. (Alberternst and Böhmer, 2006), thus becoming the most widespread and troublesome alien species on both continents (Weber 2003 cited by Barney, 2006). The species is broadly regarded as one of the most invasive plant species in Europe, also listed by the World Conservation Union and FP6-DAISIE project as one of the top one hundred invasive species of global concern (Lowe *et al*., 2000 cited by Kabat *et al*., 2006; DAISIE, 2005-2008; Lambdon *et al*., 2008).

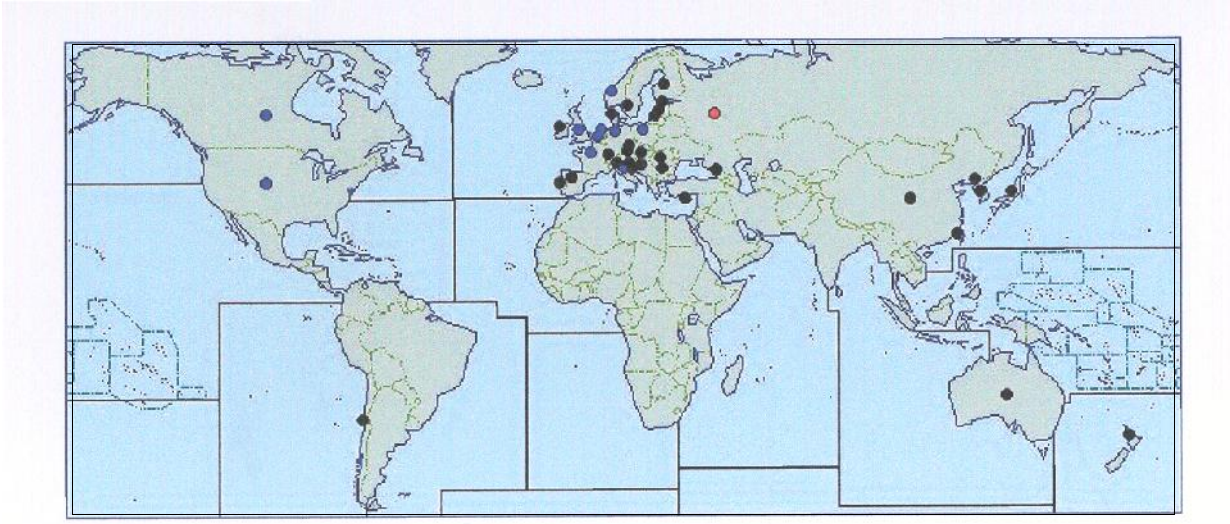

Photo 1. Naturalised distribution of Japanese knotweed: ●= Present, no further details; ●= Widespread; ●= Localised; ●=Confined and subject to quarantine; ●= Occasional or few reports; ● = Evidence of pathogen; ●= Last reported; ●= Presence unconfirmed; ●= See regional map for distribution within the country (source http://www.cabi.org/isc/datasheet/23875)

Hence biological invasions are considered one of the key components of global change (Arim *et al*., 2006) with significant impacts on populations, communities, and even ecosystems (Bailey *et al*., 2007), in RS among the spreading invasive plant species, *F. japonica* is one of the leading threats to biodiversity, natural habitats and their surrounding areas.
Considering factors such as climatic and soil conditions, RS is definitely one of the area for potential distribution japanese knotweed not only because it is generaly a temperature species (Maruta, 1983) but also because it grows on various terrains and soil type (Locandro, 1973), most of wich are present in RS (photo 2).

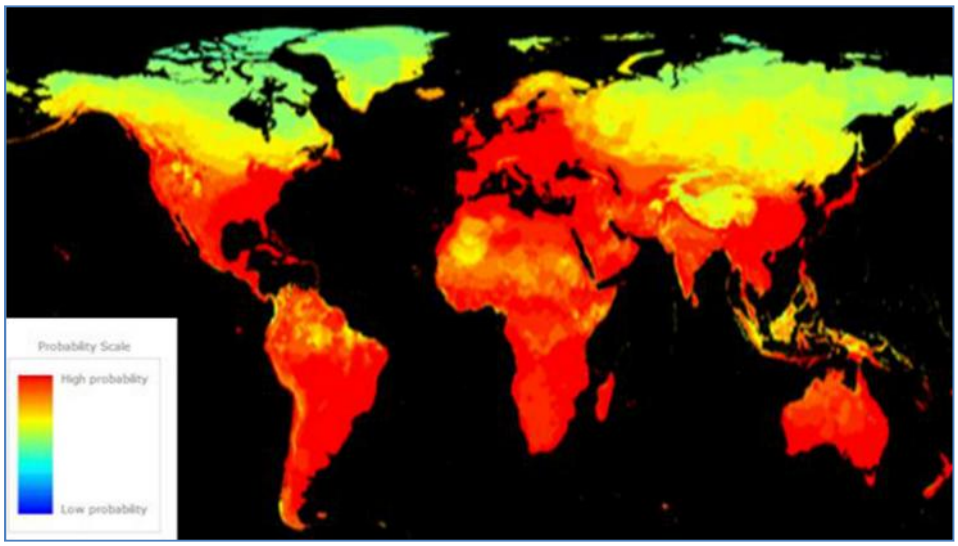

Photo 2. Area of potential distribution of *F. japonica*, considering factors such as climatic and soil conditions

Spreading potential, aggressiveness and invasiveness of Japanese knotweed, as well as all facts mentonied above were the background to the main goal of this study which was to carry out distribution mapping of Japanese knotweed in north western part of RS with priorization process for mentonied area.

Material and method

The current research mainly focuses on the north western part of RS in relation to species habitat requirements and main environmental features. Field survey was conducted during the vegetation period (May to September) 2013. Assessment of the occurrence and distribution of Japanese knotweed were taken along the roads in the urban areas, between the settlements in ruderal and less arable land, and on the edges of farmland, along the river Sava, in ditches and on the edges of forests. Quantitative distribution, study species density measure was assessed based on Blanque Braun (1964) method. During fieldwork Fallopia stands were mapped and recorded with GPS, while polygons were digitized using GIS software. All stands have been assigned to size classes (0-10m^2; 10-100m^2; 100-1000m^2; 1000-10000m^2; >10000m^2).

Species habitat requirements and main environmental features

The Japanese knotweed can usually tolerate a wide variety of environmental conditions ranging from high shade, high temperatures (even drought) to high salinity. In its native range, Japanese knotweed is a pioneer species on volcanic slopes and as invasive it invades disturbed habitats, tolerating a variety of soil structures and textures and pH levels, ranging from 3 to 8 (Pysek, 2006). It frequently occurs in riparian habitats (e.g. along river banks), but because of its invasive nature it also tolerates disturbed habitats, such as railroad tracks and roadsides (Forman and Kesseli, 2003). Other studies undertaken on *F. japonica* also revealed its preference for: boundary walls in farmlands, urban non-industrial land, ruderal habitats, meadows, natural/semi-natural forests, roadways etc. (Tiébré *et al*., 2008). The species usually installs in open places, its growth and abundance being seriously affected by shading. The rhizomes are very resistant to low temperatures, thus permitting its survival in harsh climatic conditions (up to absolute minimum temperature of -30.2° C) (Barney *et al*., 2006).

Results and discussion

A wide-spread distribituion of invasive weed species Japanese knotweed was observed in the number of municipality of Republic of Srpska, specialy in the urban parts of Banja Luka, Prnjavor, Gradiška, Srbac and Derventa but as well between the above mentioned municipalities along the roads in populated areas, between settlements in ruderal and less arable land, and on the edges of farmland, along the river Sava in the trenches and on the edges of forests (photo 3,4,5,6).

Photo 3. *F. japonica* between Srbac and Derventa - monodominant

Photo 4. *F. japonica* in orchard near reaver Sava community

Photo 5. *F. japonica* in urban area of Derventa

Photo 6. *F. japonica* around arable land

The abundance, estimated based on the number of steams, points to a high density of individuals on sq.m, e.g. up to 50 steams/sq.m. in the Sava river flood plain as well between Srbac and Derventa along the roads in populated areas, in ruderal and less arable land, on the edges of farmland, and on the edges of forests. It is widely recognized that this species forms dense patches, significantly reducing the diversity of native species, shading up other plants and slowing nutrient cycling (Barney *et al*., 2006). Also this invasive weed species causes flood hazards (Edward and Howel, 1989) inceasing the risk of river bank erosion, while its rhizomes can displace foundations, walls, pavements and drainage works (Lucandra, 1973; Beerling, 1991). Topsolil mineral contet is significantaly greater under *F. japonica* stands than under native vegetation, especially K and Mn content (Vanderhoeven *et al*., 2005).
Only in the north western part of RS was recorded 15 Japanese knotweed stand with covering area of 30.624,23 m^2. Two polygons less than 100 m^2 were recorded in urban part of Banja Luka, six polygons (100-1000 m^2) were recorded betwen Srbac and Derventa, as well as seven polygons (1000-10.000 m^2) (Photo $7_{1\text{-}15}$).

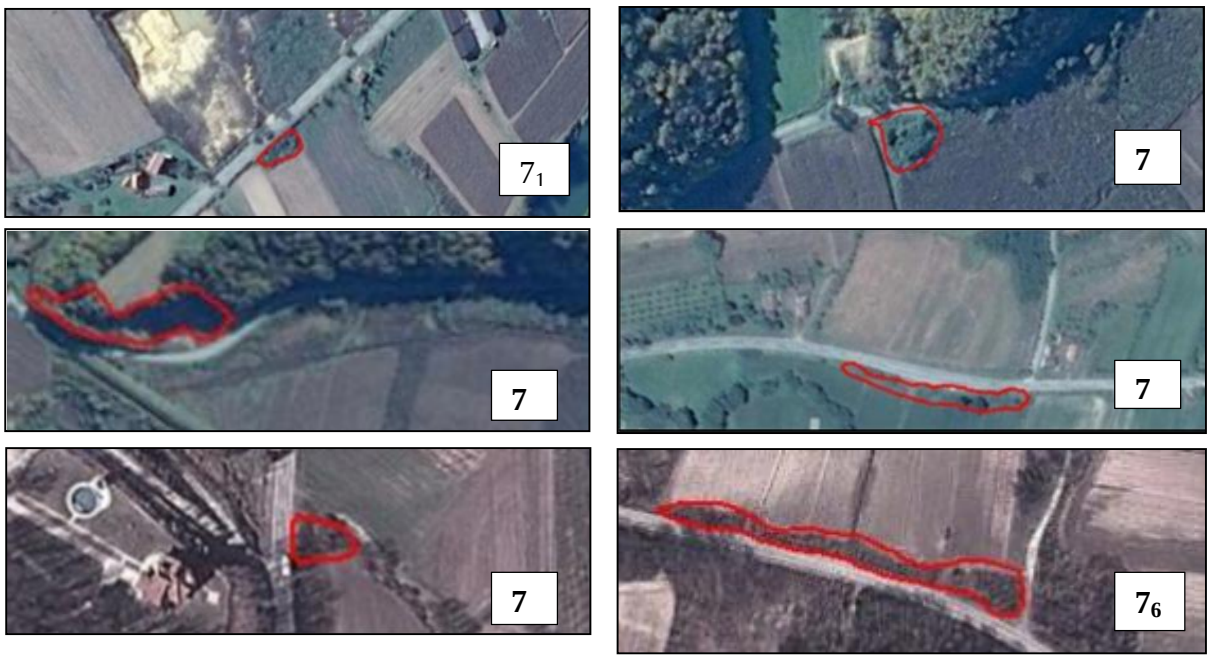

Photo $7_{1\text{-}15}$. 15 Fallopia stand in the north western part of Republic of Srpska: 7_1-$_{14}$ - Areas between Srbac and Derventa polygons less than 1000 m2 and from 1000-10.000 m^2; 7_{15} Urban part of Banja Luka polygons less than 100 m^2.

Conclusion

With a great impact potential, Japanese knotweed is preventing the growth and development of other plant species forming large monodominatne community which directly and adversely affect natural habitats, threating to open and riparian areas and dramatically reduces species diversity.

In the north western part of Republic of Srpska Japanese knotweed stand occurs in wet grassy lowland areas but is also found on hillsides, sunny sites in coastal areas, wetlands and riparian areas, but predominantly it is found near human settlement, along river banks and in waste areas.

Considering the current research in the north western part of Republic of Srpska japanese knotweed is in significant expansion, resulting in negative ecological, economic and social impact. Regarding to those research priorization process for mentonied area on local level is of a great importance. Under the given circumstances, undertaking comprehensive studies on the species characteristics and distribution potential on one hand and developing eradication and control methods, on the other are highly recommended.

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