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ESTIMATION OF *REYNOUTRIA JAPONICA* HOUTT. BIOMASS IN SLOVAKIA STANOVENIE BIOMASY *REYNOUTRIA JAPONICA* HOUTT. NA SLOVENSLU

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Biomass of *Reynoutria japonica* (Japanese knotweed), an invasive species of temperate Asia origin, was estimated in Slovakia (Central Europe). The data on standing crop of the species in Western (Bratislava) and Central Slovakia were higher than those reported from the United Kingdom and Southern Bohemia, viz. higher than 2,000 g m⁻². Biomass of the main stem predominated (45-70%) in the above-ground biomass and leaves participated only by 15-30%. The underground biomass to above-ground biomass (R:S) ratio was higher than 1. Vertical structure of the stand biomass is typical for dense and tall (3-4 m high) stands with leaves in upper layers (horizons).

Key words: *Reynoutria japonica*, invasive species, alien plant, shoot biomass, underground biomass, Slovakia

Introduction

Reynoutria japonica HOUTT., Japanese knotweed (syn.: *Pleuropterus cuspidatus*, *Fallopia japonica*) behaves in Europe as an invasive species in habitats influenced by man, commonly along riverbanks, exhibiting strong competitive ability (GRIME et al. 1988, BEERLING et al. 1994). Fast growth and high productivity, dense and tall stands are typical features for the species in Europe. *Reynoutria japonica* is here considered as an agriophytes (LOHMEYER et SUKOPP 1992) or a hemi-agriophyte (KORNAS 1990).

BROCK (1995) and HORN et PRACH (1995) published the first data on the species biomass from the British Isles and the Czech Republic, respectively. Within the studies of invasive behaviour of several alien species in Central Europe (cf. ELIÁŠ 1992, 1993), we also estimated the biomass of *Reynoutria japonica* in Slovakia. The aim of the paper is, in form of a preliminary short communication, to report on the biomass estimation in Slovakia and to compare the data with those from other localities/countries.

Reynoutria japonica was probably introduced to the territory of the Slovak Republic at the beginning of the century. The earliest data on the spontaneous occurrence in Slovakia are dated to the twenties and later. In 1969 only 18 localities were known (HAJDÚK 1970), but since that time *Reynoutria japonica* has spread rapidly over the country, especially during the last decade (cf. ELIÁŠ 1995). The species has formed dense and tall stands along rivers, roads and in settlements.

Methods

Three different stands were chosen for biomass estimation: two in Central Slovakia (CS: Blatnica, Kralovany) and one in Western Slovakia (WS: Bratislava). In CS they were located along roads near rivers, in WS along a road in the city.

More than 60 shoots were sampled at the end of August 1994 (CS) and at the beginning of September (WS). In CS shoots were

randomly selected and cut at the same base. In WS all shoots of 1x1 m quadrat were cut. The plants were oven-dried for 48 hours at 80-90°C and weighed. In Bratislava, underground organs (rhizomes with roots) up to 50 cm deep were excavated from the same 1x1 m sample plot.

In the same stands, quadrats of 1x1 m in size were randomly selected, all rooting shoots were counted and stand density was estimated (number of individuals per square meter). (The spacing of individuals is contagious). Stand height and height of individual plants were also measured and recorded.

Total shoot biomass was estimated on the basis of the average shoot weight mass. In Bratislava, the stratified (30 cm long segments) harvest method was used. The biomass of stems, leaves and inflorescences was estimated separately.

The data on the above-ground biomass were compared with those for other species native and / or naturalized in Central Europe (cf. ELIÁŠ 1978, 1983, 1992, 1993, UHERČÍKOVÁ et ELIÁŠ 1987).

Results and Discussion

The above-ground biomass of *Reynoutria japonica* estimated in CS and in WS was close to our previous data on shoot biomass of tall-stem ruderal communities (ELIÁŠ 1978, 1983), viz. larger than 2,000 g m⁻². In Blatnická dolina valey, it was about 2,100 g.m⁻² at a density of 12 shoots per square meter. The mean biomass of a tall (dominant by size hierarchy) shoot varied between 165 and 399 g, but the shoots with biomass lower than 50 g were also found in the stands.

The data on standing crop of *Reynoutria japonica* in Slovakia were higher than those reported by BROCK (1995) from the UK (937 g.m⁻² on average, range 603-1269) and by HORN et PRACH (1995) from Southern Bohemia (903 g.m⁻²).

The difference can be caused by higher stand density and stand/plant height in Slovakia, in comparison with the data from Western Europe. Stand density was on average about 15 shoots per square meter and height was 3-4 m. This fact is in a good

agreement with the stand density — stand biomass correlation diagramme published by ELIÁŠ (1978) for several ruderal communities or by ELIÁŠ (1983) for *Sambucus ebulus* stands.

BEERLING et al. (1994) referred the data from productivity studies on *Reynoutria japonica* by the Institute of Terrestrial Ecology in Cumbria: it considers *Reynoutria japonica* to be comparatively one of the most productive terrestrial plant species in the UK, achieving the yields of 25-37 t.ha⁻¹ (dry weight) whilst on derelict land the yields of 11 t.ha⁻¹.year⁻¹ were reported.

Underground biomass (rhizomes + roots) up to 25 cm was estimated by BROCK (1995) at nearly 1,500 g m⁻² (range 1,339-1,596). Our data from Bratislava are higher: underground biomass up to 50 cm was about 3,000 g m⁻². The underground biomass to above-ground biomass (R:S) ratio was higher than 1. The data are similar to the underground biomass of *Phragmites communis* estimated by FIALA (1976) in Southern Slovakia (approx. 70 km SE of Bratislava): 2,650 and 3,352 g.m⁻², R:S ratio was 1.81 and 1.87. BEERLING et al. (1994) referred also the data for *Reynoutria japonica* rhizome standing crops (excluding above-ground biomass) ranging from 11.9 to 30.1 t.ha⁻¹ (dry weight).

Biomass allocation into the above-ground organs of *Reynoutria japonica* is presented by the following data: Stems participated on the shoot biomass by 45-72%, leaves by 15-30%, and inflorescences by 3-6%, depending on stage development of the reproductive organs. Lateral branches reach cca 15% of the shoot biomass.

Vertical structure of the *Reynoutria japonica* stand is characterized by an absence of leaves within the dense stand: main stems dominated up to a 2.1 m height of a stand where only few small live lateral branches and leaves were found. Vertical distribution of biomass was similar to the other tall stem communities, e. g. to *Iva xanthiifolia* stands in Trnava (ELIÁŠ 1983). But architecture of individual plants of both the *Reynoutria* and *Iva* species is extremely different. Upper parts of *Reynoutria japonica* shoots are not erected but inclined and have horizontally inclined leaves (cf. also GRIME et al. 1988).

Súhrn

Po prvý raz sa na Slovensku stanovila biomasa *Reynoutria japonica*, invázneho druhu stredoázijského pôvodu. Údaje, ktoré sa zistili na západnom (Bratislava) a strednom Slovensku o produkcii biomasy, sú vyššie ako údaje z Veľkej Británie a južných Čiech, t.j. vyššie ako 2 000 g.m⁻². V nadzemnej biomase prevládala

biomasa stoniek (45-70%) a listy sa zúčastňovali iba 15-30 Pomer podzemnej biomasy k nadzemnej (R:S) bol vyšší ako Vertikálna distribúcia biomasy v poraste bola typická pre husté a vysoké (3-4 m) porasty s listami v hornej vrstve.

Kľúčové slová: *Reynoutria japonica*, invázny druh, zavlečená rastlina, nadzemná biomasa, podzemná biomasa, Slovensko

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Informácia

DEMO, Milan: "Systémy pestovania plodín v rôznych sústavách rastlinnej výroby pri nízkych vstupoch dodatkovj energie a rešpektovaní ekologických zásad." Projekt VEGA č. 1067/94

Zistili sa základné poznatky o chemických a fyzikálnych vlastnostiach skúmanej hnedozeme (nevýhovujúci stav pôdnej štruktúry, utlačenie podorničného horizontu, relatívne nízky obsah humusu a jeho málo priaznivá kvalita, kyslá pôdna reakcia) a o ich zmenách vplyvom rozdielnych modelov pestovateľských sústav, spôsobov obrábania pôdy (orba do hĺbky 0,2 m + povrchová úprava, spracovanie kombinovaným kypričom) a spôsobov výživy a hnojenia. Počas štyroch rokov sledovania (1994-1997) sa zistila určitá tendencia zmien v kvantite a kvalite humusu, v pôdnom chemizme a vo fyzikálnom stave pôdy. Priaznivejšie parametre sa zistili na tetrakultúrnej pestovateľskej sústave a pri minimálnom obrábaní pôdy.