MONITORING OF THE *HELIANTHUS TUBEROSUS* (L.) - AS AN INVASIVE WEED OF NATURAL ECOSYSTEMS

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Abstract: *Helianthus tuberosus (L.) is a perennial broadleaf plant, native to North America. In the years 2010 and 2011 were conducted a surveys to detected the occurrence and distribution of Jerusalem Artichoke (Helianthus tuberosus L.) in Prievidza District and Piešťany District. In Prievidza District was monitored the localities among the riverbanks (47.15 km) of Nitra River and Handlovka River. Five localities in Prievidza District were chosen, where occurrence and population density of Helianthus tuberosus (L.) in the years 2010, 2011 were determined. In Piešťany District were chosen three localities, where occurrence and population density of Helianthus tuberosus (L.) in the year 2011 were determined. Survey in the localities was conducted at two terms: Summer time: June - August 2010, 2011 and autumn time: September – November 2010, 2011. On the trial localities the amount of Helianthus tuberosus (L.) per m^2 was detected. An actual infestation of ecosystems with H. tuberosus was evaluated by count method per m^2. Screening of trial localities was made on the quadrant of $1m^2$ areas with four replications. One quadrant of each replication was (1.0m x 1.0m). Minimum three randomly established sample quadrants were detected. Jerusalem artichoke (Helianthus tuberosus (L.)) was found mainly on the riverbanks in dense populations. The lower densities of H. tuberosus were detected on the ruderal areas and near railway. Jerusalem artichoke (Helianthus tuberosus L.) is frequently found in moist habitats such as river and stream banks, meadows and waste areas, as well as in cultivated fields. Helianthus tuberosus (L.) is not only noxious invasive plants with high potential to become weed in agricultural landscape. This plant is also medicinal plant, with high nutritional quality and with its high biomass production has potential to become a source for production of ethanol for biofuel. The originality of this paper is in monitoring of an invasive plant species Jerusalem Artichoke (Helianthus tuberosus L.) in the southwestern part of Slovak Republic and its distribution in natural ecosystems.*

***Key words*:** *Helianthus tuberosus (L.), occurrence, river bank*

INTRODUCTION

Jerusalem artichoke (*Helianthus tuberosus* L.) is a perennial broadleaf plant, native to North America, possibly originating in the Ohio and Mississippi River valleys. Jerusalem artichoke is best adapted to rich, moist soil that can be found along roadways, in wasteland areas and gardens (WYSE, et al. 1986). Jerusalem artichoke is spreading primarily by well-developed fleshy, tuber bearing rhizomes. Clones of this species often appear in fields and at woodland edges with up to several hundred individual stems separated from each other by 10-12 cm or more. The plants are erect, often reaching heights of more than 2 m, varying from no branching to branching growth forms (STAUFFER, et al. 1975).

This plant is not only weed but also plant with high biomass production and potential to produce ethanol for biofuel. Allelopathy may be an advantageous trait in Jerusalem artichoke under cultivation, as it potentially reduces weed interference with the crop, theoretically allowing a reduction of mechanical or chemical input required for weed management. However, this trait may also be unfavorable if other crops are cultivated in

rotation with Jerusalem artichoke or in areas infested by this species (TESIO, et al. 2010).

MATERIAL AND METHODS

In the years 2010 and 2011 were conducted a surveys to detected the occurrence and distribution of *Helianthus tuberosus* L. in Prievidza District and Piešťany District. In Prievidza District was monitored the localities among the riverbanks (47.15 km) of Nitra River and Handlovka River.

Five localities in Prievidza District were chosen, where occurrence and population density of *Helianthus tuberosus* (L.) in the years 2010, 2011 were determined. Localities:

- Village Koš – ruderal areas, wastelands
- Town Bojnice, part Kúty,
- Town Prievidza, locality Bus station Prievidza – Cíglianska cesta,
- Railway between Nitrianske Pravno and Prievidza Town,
- Left riverbank of the river Handlovka near village Veľká Čausa.

In Piašťany District were chosen three localities, where occurrence and population density of *Helianthus tuberosus* (L.) in the year 2011 were determined. Localities:

- Lido – an old recreation area near town Piešťany, which is not used for its function nowadays – the first locality was riverbank of river Váh, the second locality was the biocorridors and the third locality was the ruderal areas, wastelands.

Survey in the localities was conducted at two terms:

- Summer time: June - August 2010, 2011
- Autumn time: September – November 2010, 2011

On the trial localities the amount of *Helianthus tuberosus* (L.) per m^2 was detected. An actual infestation of ecosystems with *H. tuberosus* was evaluated by count method per m^2. Screening of trial localities was made on the quadrant of $1m^2$ areas with four replications. One quadrant of each replication was (1.0m x 1.0m). Minimum three randomly established sample quadrants were detected.

RESULTS AND DISCUSSIONS

Jerusalem artichoke (*Helianthus tuberosus* (L.)) was found mainly on the riverbanks in dense populations. The lower densities of *H. tuberosus* were detected on the ruderal areas and near railway (table 1; table 2). Average density of *Helianthus tuberosus* rose up from year 2010 to year 2011 really fast. Because of this plants of Jerusalem Artichoke with its dense populations completely destroy natural ecosystems of riverbanks of river Váh near Piešťany and village Veľká Čausa.

Jerusalem artichoke is frequently found in moist habitats such as river and stream banks, meadows and waste areas, as well as in cultivated fields and orchards (GLEASON and CRONQUIST, l99l).

In the environmental conditions of Slovakia *H. tuberosus* is propagated mainly by vegetative organs – rhizomes and tubers (under-ground system of rhizomes and tubers) (LOHMEYER, et al. 1992) Swanton and CAVERS (1989) reported a higher allocation of carbohydrates to clonal growth than to sexual reproduction. Compounds are initially stored in the above-ground plant organs and later reallocated into the tubers (MCLAURIN, et al. 1999). New tubers production starts in July and August (it is a short-day plant from point of tuberisation), the decomposition of old tubers is initiated in April and ends in June (HARTMANN, et al. 1995). The populations of *H. tuberosus* reach their maximum density in May and June and then the number of shoots decline (Fehér, Končeková, 2005).

Table 1

Average density of *Helianthus tuberosus* (L.) (plants per m^2) in the year 2010

Locality	Average density of *Helianthus tuberosus* (L.) (plants per m^2)
Village Koš	5
Town Bojnice	0
Town Prievidza	0
Railway to Prievidza	3
Riverbank of Handlovka	87

Table 2

Average density of *Helianthus tuberosus* (L.) (plants per m^2) in the year 2011

Locality	Average density of *Helianthus tuberosus* (L.) (plants per m^2)
Village Koš	24
Town Bojnice	0
Town Prievidza	0
Railway to Prievidza	15
Riverbank of Handlovka	126
Riverbank of Váh	265
Biocorridors in Lido	0
Ruderal areas in Lido	85

CONCLUSIONS

Jerusalem Artichoke (*Helianthus tuberosus* L.) form a dense populations on the riverbanks of river Handlovka near village Veľká Čausa and river Váh at the locality Lido near Piešťany. Its density rose up from year 2010 to year 2011. *Helianthus tuberosus* (L.) plants were detected also in wastelands and ruderal areas near villages and railway.

Helianthus tuberosus (L.) is not only noxious invasive plants with high potential to become weed in agricultural landscape. This plant is also medicinal plant, with high nutritional quality and with its high biomass production has potential to become a source for production of ethanol for biofuel.

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