



## PHYTOLACCA ACINOSA ROXB. – A NEW ANTHROPOPHYTE IN THE FLORA OF POLAND

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**ABSTRACT.** This study reports the location and presents a characteristic of a new alien species in the flora of Poland, i.e. *Phytolacca acinosa* Roxb. The position of *Ph. acinosa* is found in the Małopolska province, on the outskirts of the city of Tarnów. It is located at the edge of bushes, at a road leading through the area of settlement tanks and solid sludge dumps of a chemical plant Zakłady Azotowe S.A. in Tarnów-Mościce. *Phytolacca acinosa* plants are accompanied by species characteristic of nitrophilous ecotone forest edge communities and ruderal species.

**KEY WORDS:** *Phytolacca acinosa*, Phytolaccaceae, Indian Poke, Indian Pokeweed, anthropophytes, alien plants, Polska, Tarnów

### INTRODUCTION

The genus *Phytolacca* L., Sp. Pl. 1:441. (1753) (FLORA URSS 1936, INTERNET a, b) belongs to the class *Magnoliopsida*, order *Carophyllales*, family *Phytolaccaceae* Lindl. (SŁOWNIK BOTANICZNY 1993). According to DOSTÁL (1989) it belongs to the order *Phytolaccales*. It comprises 25-35 species (ARMITAGE 1997, JELITTO et AL. 2002, INTERNET c, d) distributed worldwide, mainly in America in the tropical and subtropical zones (HEß et AL. 1967, JELITTO et AL. 2002, WIELKA ENCYKLOPEDIA PRZYRODY 1998, INTERNET d, h). They are herbaceous plants as well as trees and shrubs. Some of them inhabit areas outside their natural range.

On the European continent the most commonly recorded species from genus *Phytolacca* is *Ph. americana* L. (syn. *Ph. decandra* L.), originating from North America and widely naturalized in southern Europe, locally also in western and central Europe (NYMAN 1878-1882, HEGI 1912, TUTIN et AL. 1964, HEß et AL. 1967, SOWA and WARCHOLIŃSKA 1992, INTERNET a). It was also recorded on the British Isles (CLAPHAM et AL. 1962) and in the European part of Russia (BOSIEK 1989, BARABASZ and KAMAJEWA 1989, KOMŻA and POPOW 1990, SAGAŁAJEW and BOCZKIN 2002, WASJUKOW 2004). As it was reported by FOUNIER (1946), this species was introduced as early as 1650 and the first known cultures from Germany, France and Italy date back to the early 18th century (MASTERNAK 1998). It was used not only as an ornamental perennial in gardens, but also a red dye for fabrics was produced from green plants (HRYNIEWIECKI 1933, SŁOWNIK BOTANICZNY 1993). Moreover, the dark red juice from its fruits was used to colour poor quality wines (HRYNIEWIECKI 1933, HEGI 1912, TUTIN et AL.

1964, WIELKA ENCYKLOPEDIA PRZYRODY 1998). According to JELITTO et AL. (2002), pigments in juice from berries are highly stable and thus they may be applied to dye also other foodstuffs. The old Polish common names referring to dying fabrics (“alkiermes farbierski” (HRYNIEWIECKI 1933), “alkiermes barwierski” (SŁOWNIK BOTANICZNY 1993)) stem from that fact. The present Polish name is “szkarłatka amerykańska” (GAWRYŚ 2008).

Another species from genus *Phytolacca* – *Ph. acinosa* Roxb. (Fl. Ind. 2: 458. 1832) (INTERNET e) is much less common in Europe. It is of East Asian origin. Its natural range covers Japan, China up to the Himalayas and western India (CLEMENT and FOSTER 1994, MASTERNAK 1998, JELITTO et AL. 2002, HAEUPLER and MUER 2007, INTERNET f, h, q) (Fig. 1). It was brought to Europe as a vegetable as well as an ornamental plant (POLUNIN and STANTON 1984, GALERA 2003, ŁUKASIEWICZ 2003).

Its occurrence was reported in Denmark and Sweden on disturbed habitats and urban areas (INTERNET g, h), in Bulgaria, Slovenia (INTERNET h) and the British Isles (CLEMENT and FOSTER 1994, INTERNET h).

In Germany (INTERNET i, j), in the former Czechoslovakia (DOSTÁL 1989) and in Romania (TUTIN et AL. 1964) the occurrence of *Ph. esculenta* Van Houtte is reported, a species which by most sources (INTERNET b, c, d, m, r) is treated as a synonym of *Ph. acinosa* Roxb. However, Germans, Czechs, Slovaks and some Britons apply the approach proposed by TUTIN et AL. (1964). In Flora Europaea (TUTIN et AL. 1964) among herbaceous species only *Ph. americana* and *Ph. esculenta* Van Houtte (Fl. Serres Jard. Eur. 4: 398 (1848)) are described. It needs to be added that both the origin and morphological characters of *Ph. acinosa* and *Ph. esculenta* are similar.

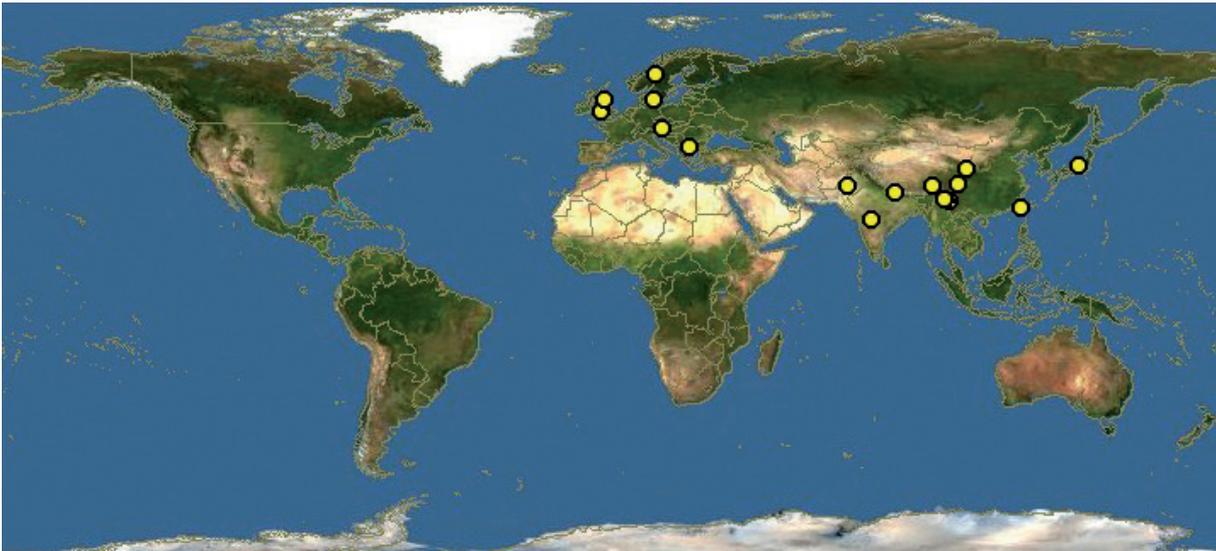


FIG. 1. Worldwide distribution of the *Phytolacca acinosa* Roxb. – natural positions in Asia and synanthropic positions in Europe (INTERNET h)

In Poland *Ph. acinosa* has not been reported to date, similarly as *Ph. americana* or *Ph. esculenta* (ROSTAŃSKI and SOWA 1986-1987, SOWA and WARCHOLIŃSKA 1992, RUTKOWSKI 1998, ZAJĄC et AL. 1998, ZAJĄC and ZAJĄC 2001, MIREK et AL. 2002). None of these species was found in the Polish database of alien species (INTERNET k). Occasionally it is planted in gardens as an ornamental perennial (MARCINKOWSKI 1991). The only available piece of information of the spontaneous self-sowing of *Ph. acinosa* in Poland comes from GALERA (2003), but it pertains only to the Botanical Garden in Poznań, one of the six Botanical Gardens investigated by that author. The search for plants of the species outside the Garden was no successful.

In the course of botanical studies conducted in 2006 in the Zakłady Azotowe S.A. in Tarnów-Mościce the presence of a small population of *Ph. acinosa* was found in roadside brushes. This position turned out to be the first report on this species as an anthropophyte in Poland.

#### CHARACTERISTICS OF THE POSITION

The position of *Ph. acinosa* is located in Klikowa (ATPOL square EF 67), in the north-western district of the city of Tarnów in the Małopolska province (Fig. 2).

Geobotanically the analysed area belongs to the Baltic Division, the Subdivision of the Piedmont Basin Belt, the Sandomierz Basin Region, the Radomyski District (the interfluvium of the Dunajec and Wisłoka) (SZATA ROŚLINNA POLSKI 1977).

In the physico-geographical regionalization of Poland (KONDRACKI 2001), this area belongs to the Carpathian Megaregion, the Western Carpathian Province with the Podkarpacie Region (the Western Carpathians), the Northern Podkarpacie Sub-province, the

Sandomierz Basin Macroregion, the Tarnów Plateau Mesoregion.

According to the classification presented by ROMER (1949) it is found in the climatic region of the Piedmont Lowlands and Basins, including the area of the Sandomierz Basin and the Silesia Lowland, characterised by relatively nice weather throughout the year, a long vegetation period (220-225 days) and the annual rainfall of 600-800 mm. Woś (1995) classified the discussed area to Region XXVII, the Tarnów-Rzeszów Region, which is characterised by frequent very warm days at the simultaneous precipitation.

Plants grow at the edge of small thickets, at a concrete road leading to the settlement tanks and solid sludge dumps belonging to Zakłady Azotowe S.A. in Tarnów-Mościce.

Observations of the population were conducted in the years 2006-2007. At the beginning of July 2006 three specimens with several shoots were reported.

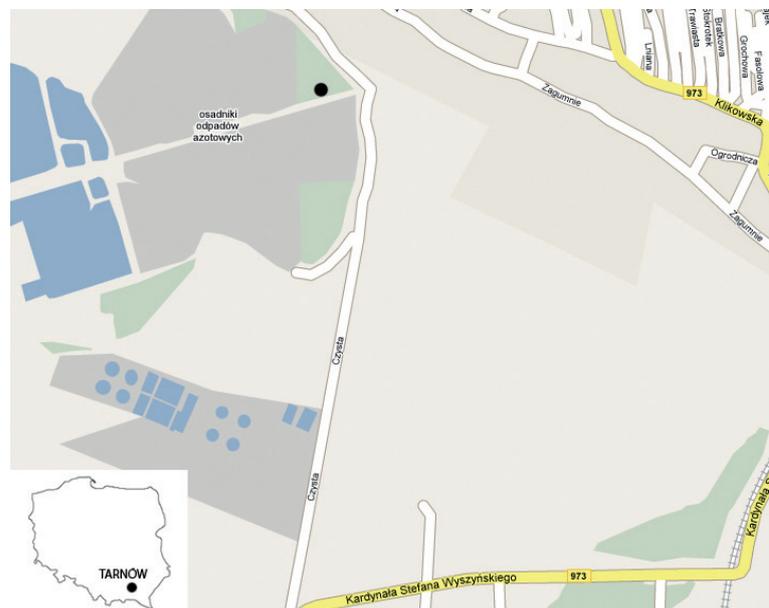


FIG. 2. Location of the *Phytolacca acinosa* Roxb. position in Tarnów

Two specimens formed both vegetative and fertile shoots from considerably thickened roots, while the third specimen formed only vegetative shoots. One of the specimens was dug out. Its aboveground parts were dried and deposited at the herbarium (POZ), while the root was transplanted to a home garden in Poznań.

Repeated observations at the position were conducted in the middle of August 2006. Fruits were already set on the fertile shoot. Within a radius of up to 1.5 m from maternal plants the presence of 73 seedlings of this species was recorded. The accurate determination of seedlings was verified by transplanting several of them to the garden and conducting further observations.

Successive observations were conducted in June 2007. This time seven specimens were found, which formed jointly a total of 23 shoots, including only one fertile (Phot. 1). A list of plants co-existing with *Ph. acinosa* was prepared, with the nomenclature following MIREK et AL. (2002). The tree and shrub layer was represented by *Betula pendula*, *Populus* sp., *Prunus padus*, *Quercus robur*, *Salix cinerea* and *Sambucus nigra*. In the herb layer the following species were recorded: *Achillea millefolium*, *Aegopodium podagraria*, *Arrhena-*



PHOT. 1. *Phytolacca acinosa* Roxb. in a roadside thicket

*therum elatius*, *Artemisia vulgaris*, *Atriplex patula*, *Capsella bursa-pastoris*, *Chenopodium polyspermum*, *Coryza canadensis*, *Corylus avellana*, *Dactylis glomerata*, *Epilobium adnatum*, *Fallopia convolvulus*, *Galeopsis tetrahit*, *Galium aparine*, *Heracleum sibiricum*, *Juglans regia*, *Lactuca serriola*, *Papaver rhoeas*, *Phleum pratense*, *Plantago major*, *Poa annua*, *Poa trivialis*, *Polygonum aviculare*, *Quercus robur*, *Ranunculus repens*, *Sisymbrium loeselii*, *Solidago canadensis*, *Stellaria media*, *Tanacetum vulgare*, *Taraxacum officinale*, *Thlaspi arvense*, *Tussilago farfara*, *Veronica persica* and *Vicia sepium*. They included also pioneer species, characteristic of nitrophilous ecotone forest edge communities as well as species from class *Stellarietea mediae*, particularly ruderal species from order *Sisymbrietalia*. The presence of *Ph. acinosa* among them is most probably either a consequence of parts of plants or seeds being accidentally brought with farm waste or a result of

ornithochory. The closest buildings are located at a distance of approx. 3-4 km from this position, but it was not verified whether this species is grown in the accompanying gardens.

#### TAXONOMIC CHARACTERISTICS OF *PHYTOLACCA ACINOSA* ROXB.

The taxonomic characteristic of *Ph. acinosa* presented in this study was prepared based on the descriptions from available literature (ARMITAGE 1997, JELITTO 2002, NEW ATLAS... 2002, HAEUPLER and MUER 2007, INTERNET d, l, m, n) as well as the observations conducted by the author. The Polish species name "szkarłatka jagodowa" was given after GAWRYŚ (2008)

It is a perennial, growing to a height of up to 1.5-2 m (Phot. 1). Roots are thick, in character being storage roots, with several cambium rings (INTERNET o). Stems are naked, erect, green in colour, sometimes slightly red-tinted, rather thick, juicy, branching off in the upper part.

Leaves are single, with even margins, elliptical to elliptic-lanceolate, 10-30 cm long and 4.5-15 cm wide. Leaf stalks range from 1.5 to 3 cm in length, leaf base is wedge-shaped, the apex of the leaf blade is sharp or pointed.

Numerous, densely clustered flowers form a cylindrical raceme of 15-20 cm in length, which grows sympodially and is erect not only during flowering, but also during fruiting. Flowers are radial, bisexual, of approx. 8 mm in diameter, growing from axils on peduncles 6-10 (13) mm long. The simple perianth (not differentiated into the calyx and the corolla) is composed of five non-connate leaflets, initially white in colour, later changing into green to become purple-red during fruit ripening (Phot. 2). Leaflets of the perianth are elliptical to egg-shaped or slightly elongated, 3-4 mm in length and 2 mm in width. After pollination of flowers they do not drop, but tilt backwards. There are 8-10 stamens, equal in length to the perianth leaflets, filaments are perennial, white, subulate, wider at the base,



PHOT. 2. A fruiting shoot of *Phytolacca acinosa* Roxb.

TABLE 1. A list of most important characteristics differentiating *Ph. acinosa* Roxb. and *Ph. americana* L.

Species	<i>Ph. acinosa</i>	<i>Ph. americana</i>
Plant height (cm)	50-150 (200)	100-250 (300)
Shoot colour	green, sometimes reddish tinted	most frequently reddish tinted
Raceme	always erect, even after flowering, 15-20 cm	arcuate or drooped inflorescence, after flowering drooping, 20-40 cm
Flower	8 carpels*, 8-10**, 7-15*** free	10 carpels, connate except for styles
Aroma	none	the whole plant has an unpleasant smell
Fruit	berry composed of 8 single-seed berries*	typical single berry (10-seeded)

\*JELITTO et AL. (2002), HAEUPLER and MUER (2007), \*\* INTERNET d, m, \*\*\* INTERNET l. Description of *Ph. americana* after: FLORA URSS (1936), TUTIN et AL. (1964), HEß et AL. (1967), INTERNET d.

with pinkish, elliptical anthers. The upper pistil is composed of 7-15 non-connate carpels. The fruit, generally defined as a berry, is juicy and composed of 7-15, most often eight, adjacent single-seed berries, forming a compound berry, approx. 7 mm in diameter (Phot. 2). Each berry has an excrescence on the top, being a remnant of the style. At maturity fruits are purple-black. Seeds are kidney-shaped, smooth, slightly 3-angulate, approx. 3 mm in length. The number of chromosomes  $2n = 18, 36, 72$  (INTERNET d, q).

The period of flowering in Poland lasts from the end of June to the end of July and ripe fruits are retained until mid-October.

This species, similarly as *Ph. americana*, is widely applied in medicine (BOWN 1995, INTERNET o, p). Interested parties may be referred to the above mentioned sources, where indications, the scope of action and active substances are given.

Since in Poland both *Ph. acinosa* and *Ph. americana* are little known and frequently mistaken, Table 1 lists the most important characteristics differentiating both species.

#### CONCLUDING REMARKS

The discovery, being the first report on *Ph. acinosa* in Poland, enriches the list of alien species with another item.

The presence of this small population of plants at different development stages, from seedlings to specimens forming flowers and fruits, indicates that it has been there for at least several years. It persists there without human interference, despite competition of numerous plant species growing there as well.

The natural self-sowing and transition of plants through successive development stages shows also that in case this position is not destroyed by human activity the population of Indian poke may not only survive in this position for a longer time, but also possibly spread.

ŁUKASIEWICZ (1986) points to the sensitivity of both *Ph. acinosa* and *Ph. americana* to low temperature and recommends covering these plants in gardens for winter. However, plants from the described position survived

a severe winter. In January 2007 the minimum air temperature in Tarnów was 32°C below zero.

It is still too early to classify the discovered species following the geo-historical classification of synanthropic plants or according to criteria applied for alien species, established by RICHARDSON et AL. (2000) (casual plants, naturalised plants, invasive plants). It is advisable to provide permanent monitoring of this position.

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- b – [http://mobot.mobot.org/cgi-bin/search\\_vast?name=Phytolacca+acinosa](http://mobot.mobot.org/cgi-bin/search_vast?name=Phytolacca+acinosa) (Nomenclatural Data Base Missouri Botanical Garden)
- c – <http://mobot.mobot.org/W3T/Search/FOC/projsfoc.html>
- d – <http://flora.huh.harvard.edu/china//PDF/PDF05/Phytolacca.pdf> (Flora of China)
- e – <http://www.ipni.org/ipni/idPlantNameSearch> (International Plant Name Index)
- f – <http://www.botany.wisc.edu/garden/db/speciesdetail.asp?genus=Phytolacca&species=acinosa> (UW-Madison Botanical Garden)
- g – <http://www.nobanis.org/speciesInfo.asp?taxaID=3232&print=1> (Database NOBANIS)
- h – <http://www.discoverlife.org/mp/20o?kind=Phytolacca+acinosa> (a coloured map of the world)
- i – <http://www.floraweb.de/MAP/scripts/esrimap.dll?name=florkart&cmd=mapflor&app=distflor&ly=gw&taxnr=23093> (a coloured map of Germany *P. esculenta* eingebürgerter Neophyt)
- j – [http://www.floraweb.de/pflanzenarten/cg\\_floramap](http://www.floraweb.de/pflanzenarten/cg_floramap) (data and map of Germany, since 1950 *P. esculenta*)
- k – <http://www.iop.krakow.pl/ias/lista.asp> (Alien species in Poland. IOP PAN Kraków)
- l – <http://ip30.eti.uva.nl/bis/flora.php?selected=beschrijving&menuentry=soorten&id=1778> (Interactive Flora of NW Europe)
- m – [http://www.efloras.org/florataxon.aspx?flora\\_id=2&taxon\\_id=200007011](http://www.efloras.org/florataxon.aspx?flora_id=2&taxon_id=200007011)
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- o – <http://www.henriettesherbal.com/eclectic/kings/phytolacca.html>
- p – <http://www.henriettesherbal.com/plants/phytolacca-acinosa>
- q – [http://www.biochange.ie/alienplants/result\\_options.php?species=95&lang=latin&p=h](http://www.biochange.ie/alienplants/result_options.php?species=95&lang=latin&p=h) (Alien Plants of Ireland)
- r – [http://www.homolaicus.com/scienza/erbario/utility/botanica\\_sistematica/hypertext/1544.htm#000000](http://www.homolaicus.com/scienza/erbario/utility/botanica_sistematica/hypertext/1544.htm#000000) (Botanica Sistematica)
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