

## CONTRIBUTION TO THE KNOWLEDGE OF THE NEOPHYTIC FLORA IN THE BOKOVO AREA (DALMATIA, CROATIA)

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Data are given for 12 neophytic species in the ruderal and weed vegetation of the Biokovo area (mostly of the Makarska Riviera) in the UTM net, quadrant XJ and XH from North – West XJ 50 to South – East XH 97.

These species are, in alphabetic order: *Ambrosia artemisiifolia* L., *Artemisia verlotiorum* Lamotte, *Bidens subalternans* DC., *Conyza bonariensis* (L.) Cronq., *C. canadensis* (L.) Cronq., *Eleusine indica* (L.) Gaertner, *E. tristachya* (Lam.) Lam., *Erigeron annuus* (L.) Pers. subsp. *annuus*, *Galinsoga ciliata* (Rafin.) S. F. Blake, *Paspalum dilatatum* Poirlet in Lam., *Phytolacca americana* L., *Tagetes minuta* L.

**Key words:** Biokovo area – Makarska Riviera (Dalmatia, Croatia) ruderal plants.

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Izneseni su podaci za 12 neofitskih vrsta u ruderalnoj i korovnoj vegetaciji Podbiokovlja (uglavnom Makarskog primorja) koje se nalaze u kvadrantima UTM mreže XJ i XH (od sjeverozapada XJ 50 do jugoistoka XH 97).

Te vrste su slijedeće (abecednim redom): *Ambrosia artemisiifolia* L., *Artemisia verlotiorum* Lamotte, *Bidens subalternans* DC., *Conyza bonariensis* (L.) Cronq., *C. canadensis* (L.) Cronq., *Eleusine indica* (L.) Gaertner, *E. tristachya* (Lam.) Lam., *Erigeron annuus* (L.) Pers. subsp. *annuus*, *Galinsoga ciliata* (Rafin.) S. F. Blake, *Paspalum dilatatum* Poirlet in Lam., *Phytolacca americana* L., *Tagetes minuta* L.

**Ključne riječi:** Podbiokovlje – Makarsko primorje (Dalmacija, Hrvatska), ruderalne biljke.

### INTRODUCTION

The flora of Biokovo, considered broadly and in detail, has for years been the subject of the floristic and vegetational research done by F. KUŠAN (1969:1–224), J. RADIĆ (1976:1–237), and there have been quite a lot of fragmentary contributions to this and broader areas, especially in the scientific publications of the *Acta Botanica Croatica* and *Acta Biokovica*, which will not be listed here.

There have been a few incidental and fragmentary data about the ruderal and weed flora (and vegetation) of this area. The neophytic (weed) flora of Makarska was discussed by TRINAJSTIĆ *et al.*, 1993:57–62.

During the last few years, systematic research has been done into the flora of Biokovo from a broader point of view, and several anthropochoric neophytic species have been discovered, and information about them is given through this contribution, the aim of which is the more complete knowledge about their chorology in the Croatian flora.

We would like to stress the existence of the adventitious plants: *Artemisia verlotiorum* Lamotte which is expanding along the whole Adriatic coast, two species of *Eleusine* of which *E. tristachya* (Lam.) Lam. is a new neophytic species in the flora of Croatia, the species *Galinsoga ciliata* (Rafin.) S. F. Blake, seen only on one place, and the species *Paspalum dilatatum* Poiret in Lam., which is expanding and conquering new habitats.

The findings are in the central coastal mezoregion of the Mediterranean macroregion (NIKOLIĆ *et al.*, 1998:29; sl. 6) in the UTM net, quadrant XJ and XH from North – West XJ 50 to South – East XH 97.

All herbarium documentary material has been stored in the scientific collection of the Herbar Biokovskog područja (Biokovo Area Herbarium) (MAKAR) – »Planina i more« Institute in Makarska.

## RESULTS OF THE SPECIES RESEARCHED INTO

### *Ambrosia artemisiifolia* L. (Asteraceae)

This North American plant is very well known in the plain, continental parts of Croatia as a widespread and dangerous weed.

We localized it in a very narrow number of localities in Makarska and over quite limited areas.

Knowing its fertility and its biology this annual plant can be expected to become a dangerous weed in the urban environment.

### *Artemisia verlotiorum* Lamotte (Asteraceae)

This species of wormwood, which is naturally widely distributed in the countries of Eastern Asia, became established in middle and south Europe a long time ago (FIORI, 1925–1929:635; HEGI, 1929 IV/2:631; OBERDORFER, 1962:890; GÖRS & MÜLLER, 1969:60).

In neighbouring Slovenia it is mentioned by ZIRNICH (1952:79–81) and MARTINČIĆ & SUŠNIK (1969) and in Italy it expanded and established its roots (PIGNATTI 1982: 103).

In some continental parts of Croatia this species was found even a quarter of century ago (MARKOVIĆ, 1970:209).

As it is known, it was found for the first time in the eumediterranean part of the Croatian coast in Split, also in ruderal vegetation (ILIJANIĆ *et al.*, 1991:60–61); and in that paper the same author suggested its expansion should be monitored.

We found it in great numbers in ruderal habitats by the sealed streams in Makarska. Its mass and number and great expansion show that these habitats were overgrown by this neophytic species a long time ago.

The Makarska findings show that this adventitious plant species is in the phase of expanding and conquering new territories.

The species *A. verlotiorum* is in the nearest relation to the species *A. vulgaris* L. which is in the flora of Croatia very often widespread in ruderal habitats, but differs from it by many of its morphological characteristics and by having a special phenology.

Indeed, *A. vulgaris* L. has a phenophase of flowering from July to October and *A. verlotiorum* from October to November.

### ***Bidens subalternans* DC. (Asteraceae)**

(Syn.: *B. bipinnata* auct. adr. orient. p.p. max., non L.)

This species was found in the flora of Croatia more than forty years ago, but the results were published rather late (TRINAJSTIĆ, 1975:171–173). It was published under the title *B. bipinnata* L.

Many Croatian authors used to write about this annual ruderal plant originating from warm parts of the American continent. They wrote about its chorology in the flora of Croatia. So it was concluded that this neophyte was present in numerous localities along the Adriatic coast, until TRINAJSTIĆ showed (1993:107–112) that is a species related to *B. subalternans* DC., explaining that the substitution occurred through the morphological resemblance of these two species and because of the lack of the corresponding literature at the time.

This species was established in the broader Makarska and Omiš areas by TRINAJSTIĆ *et al.* (1993:59).

It is detailed here because in the last few years we have followed its expansion over the broader area of Makarska. It can be said that it is largely present in ruderal vegetation from two to three hundred fifty meters above sea level (Veliko Brdo and others). In some localities (Živogošće, Strn) it appears as a weed in land devoted to vineyards and olive groves.

It starts flourishing by the end of September and phenophase of full flowering is during October. The production of seeds is large and this, together with other characteristics, have helped it to expand (anthropochoria, zoochoria).

### ***Conyza bonariensis* (L.) Cronq. (Asteraceae)**

(Syn.: *C. ambigua* DC.; *Erigeron bonariensis* L.; *E. crispus* Pourret)

By origin it is from tropical America, and has become naturalized in a lot of Mediterranean countries.

We found it in localities along the Makarska Riviera, mostly on soil cultures.

***Conyza canadensis* (L.) Cronq. (Asteraceae)**

(Syn.: *Erigeron canadensis* L.)

Although the original homeland of this species is North America, today it is spread, as an adventitious plant, over all the continents, and is considered to be a cosmopolitan species.

In the flora of Croatia it is very often in low as well as in mountainous parts. It is very variable.

It was not found in the researched area although it densely inhabites all soil cultures as a mass and dangerous weed, as well as ruderal places from the sea to four hundred meters above sea level. Possibly this shows that it started to spread recently. It is one of the most common adventitious plant in the appropriate habitats.

***Eleusine indica* (L.) Gaertner (Poaceae)**

(Syn.: *Cynosurus indica* L.)

Writing his famous work *Prodromus Florae peninsulae Balcanicae*, HAYEK (1993:360) noticed this tropical – subtropical species only in Macedonia. Since then in floristic literature this species has been recorded for new localities in the west and northeast part of the Balkan peninsula.

In Croatian flora it was noticed for the first time in Istria (HODAK, 1960:65–67) while later a lot of new findings appeared around Croatia: MARKOVIĆ & HULINA, 1970:213–215; LOVRIĆ & RAC, 1987:97–142; TOPIĆ & ŠEGULJA, 1978:229–230; TOPIĆ & KUSULJA, 1987:111; 1989:174; DUBRAVEC *et al.* 1989:95–97 and the others.

In the ruderal flora of Split it was found by ILIJANIĆ, Lj. during the autumn of 1986 though the finding was published only later (ILIJANIĆ, 1989:117); new findings in Split and the surrounding area (Kaštel Gomilica) were published by ILIJANIĆ *et al.* (1991:61–62).

In Makarska it was found for the first time in 1991, which showed that this neophyte had started spreading along the Dalmatian coast.

***Eleusine tristachya* (Lam.) Lam. (Poaceae)**

In the literature available to us, this South American plant was not known in the flora of Croatia, and may be now considered a new member of it. Even HAYEK (1993:359–360) did not mention it in the Balkan flora.

During 1996 we observed it spreading along the Makarska Riviera. We noticed it in a lot of localities (Makarska, Osejava, Makar, Krvavica, Dupci, Gornje Tučepi and elsewhere). It appears in ruderal vegetation, on embankments, by the roads, near paths and similar habitats.

In Makar we found it in great quantity by the captive stream near the spring Vratak where it massively overgrew the embankments of the road. A year later all the area was asphalted and paved so the habitat was considerably reduced.



*Eleusine tristachya* (Lam.) Lam.

*Erigeron annuus* (L.) Pers. subsp. *annuus* (Asteraceae)  
(Syn.: *Stenactis annua* (L.) Less.)

This annual North American plant was registered a long time ago as a mass weed on the cultivated land and similar habitats in low and mountain Croatia.

It was not registered for the broader Biokovo area. We found it, however, in several places as weeds in vineyards and other types of cultivated land (the lowland around the Cetina River, near the village of Svinišće etc.).

***Galinsoga ciliata* (Rafin.) S. F. Blake (Asteraceae)**

While the South American species *G. parviflora* Car. is a species very often found in Croatia and was found by TRINAJSTIĆ (1993) in Makarska. *G. ciliata* is seen very seldom in the researched area. It is also an adventitious species that spread naturally from Mexico to Chile.

We found it in the cultivated land of the monastery garden in Zaoštrog in 1996. It was not noticed to be spreading, but this can be expected in future.

***Paspalum dilatatum* Poiret in Lam. (Poaceae)**

(Syn.: *Digitaria dilatata* (Poiret) Coste)

This South American species was found in the Croatian flora near Šibenik for the first time (ILIJANIĆ, 1990:89–96), and the same author together with his associates published details of new findings in Split and Kaštel Sućurac (ILIJANIĆ *et al.*, 1991:62).

During numerous floristic field trips along the Makarska Riviera we saw it for the first time in the full spike phase in places filled up by carted land in Osejava.

Later we saw it in great numbers in a lot of localities of the littoral zone of the Biokovo area (Makarska, Podgora, Blato, Tučepi, Zaoštrog, Gradac and others).

It appears mostly along the roads on dry habitats, and, surprisingly, a dense population was found in Blato, where it grew over flat places, occupying several square meters two meters above the sea level. This habitat gives the impression at first sight of being a habitat of the species *Paspalum paspaloides* (Michx) Scribner, which is also newcomer from the tropical parts of America, and is said to have existed in the delta of the river Neretva where it was found and registered for the first time (HORVATIĆ, 1949:231–238) as the member of the *Cypero-Paspaletum distichi* Horvatić association exposed to periodical floods (ILIJANIĆ & TOPIĆ, 1997) which is completely different from the habitats of *P. dilatatum*.

Numerous new findings along the Makarska Riviera confirm the statement »... that the species *Paspalum dilatatum* intensively expanded on the eu-Mediterranean coast of the east Adriatic, so new findings can be expected« (ILIJANIĆ *et al.*, 1991:62).

***Phytolacca americana* L. (Phytolaccaceae)**

(Syn.: *Ph. decandra* L.)

This is a North American species naturalized in Croatia long time ago. It was found by RADIĆ (1976:39) in the Omiš area.

We found it in several localities in Makarska and stored it in the herbarium. It shows a tendency to spread slowly.

***Tagetes minuta* L. (Asteraceae)**

(Syn.: *T. glandulifera* Schrank)

This annual American plant, which appears in the flora of Croatia as an anthropochoric neophytic species, has been written about by ŠILIĆ (1973:27–34), TRINAJSTIĆ

(1974:231–235), PAVLETIĆ, Zi. (1987:27), ILIJANIĆ (1991:61), TRINAJSTIĆ (1993:57–62). From these works it could be seen that this neophyte appears in ruderal and weed vegetation of the warmer parts. TRINAJSTIĆ (l.c.) mentioned it for the Makarska Riviera and PAVLETIĆ, Zi. (1987:27) for the north part of Biokovo (Zagvozd area) and we put it here as two decades ago Dr. Fra Jure Radić collected it and deposited the material in the herbarium collection of the Herbarium of the Biokovo area (MAKAR) in the »Planina i more« Institute in Makarska. This shows that the species existed in the area researched into much earlier but was not registered. This work has been performed to contribute to the better understanding of the appearance, chronology and spread of these adventitious species in the area.

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## SAŽETAK

### Prilog poznavanju neofitske flore Podbiokovlja (Dalmacija, Hrvatska)

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Rad ukazuje na prisutnost neofitskih vrsta u flori Podbiokovlja koje se nalaze u kvadrantima UTM mreže XJ i XH (od sjeverozapada XJ 50 do jugoistoka XH 97): *Ambrosia artemisiifolia*, *Artemisia verlotiorum*, *Bidens subalternans*, *Conyza bonariensis*, *C. canadensis*, *Eleusine indica*, *E. tristachya*, *Erigeron annuus* subsp. *annuus*, *Galinsoga ciliata*, *Paspalum dilatatum*, *Phytolacca americana*, *Tagetes minuta*.

Prema masovnosti i brojnosti može se pretpostaviti da je većina od ovih vrsta prisutna na ovim prostorima već duže vrijeme.

Posebno ukazujemo na prisutnost vrste *Eleusine tristachya* (Lam.) Lam. koja je nova vrsta u flori Hrvatske i koja je u fazi širenja i osvajanja novih prostora, te vrstu *Paspalum dilatatum* Poiret in Lam. koju nalazimo na brojnim lokalitetima duž cijelog Makarskog primorja na odgovarajućim staništima.