Industrial Crops and Products 32 (2010) 674–677

Contents lists available at ScienceDirect

Industrial Crops and Products

journal homepage: www.elsevier.com/locate/indcrop

Short communication

Screening for natural inhibitors of germination and seedling growth in native plants from Central Argentina

Sara M. Palacios[a,*,1], Soledad del Corral[a], María C. Carpinella[a,1], Gustavo Ruiz[b]

[a] Fine Chemical and Natural Products Laboratory, School of Chemistry, Catholic University of Córdoba, Cno a Alta Gracia Km 10, Córdoba, Argentina
[b] Herbarium Marcelino Sayago, School of Agricultural Science, Catholic University of Córdoba, Córdoba, Argentina

ARTICLE INFO

Article history:
Received 10 December 2009
Received in revised form 4 May 2010
Accepted 10 May 2010

Keywords:
Native plants
Germination inhibition
Baccharis salicifolia
Ophryosporus charua
Avena sativa
Raphanus sativus

ABSTRACT

Ethanol extracts obtained from aerial parts of 71 native plants from Central Argentina were tested for their herbicidal activity in germination assays on *Avena sativa* and *Raphanus sativus*. Extracts derived from *Angelphytum aspilioides*, *Baccharis salicifolia*, *Cortaderia rudiuscula*, *Eupatorium hookerianum* and *Mandevilla laxa*, showed 100% inhibition of the germination of *A. sativa* at 10 mg/ml. In the case of *R. sativus*, extracts from *Achyrocline tomentosa*, *Angelphytum aspilioides*, *B. salicifolia*, *Melissa officinalis*, *Minthostachys verticillata*, *Ophryosporus charua* and *Podranea ricasoliana*, applied at 10 mg/ml, showed 100% germination inhibition. For each extract, the mean effective concentrations that inhibit germination (ECg_{50}), root (ECr_{50}) and shoot (ECs_{50}) growth were determined. According to these values and the extract yield, an index was calculated in order to establish a ranking of the most active plants. For inhibition of *A. sativa*, the ranking was *B. salicifolia* > *A. aspilioides* > *C. rudiuscula* > *M. laxa* > *E. hookerianum*. The ECg_{50}, ECr_{50} and ECs_{50} of *B. salicifolia* against *A. sativa* were 0.36, 0.88 and 0.91 mg/ml, respectively, showing more activity than that of 2,4-D as a germination inhibitor and 44 and 1.1 times less active than 2,4-D as a root and shoot inhibitor, respectively. The ranking for the inhibition of *R. sativus* was *O. charua* > *A. aspilioides* > *P. ricasoliana* > *B. salicifolia* > *A. tomentosa* > *M. officinalis* > *M. verticillata*. The *O. charua* extract presented ECg_{50}, ECr_{50} and ECs_{50} of 1.04, 1.04 and 1.49 mg/ml, respectively. According to the obtained results, the extracts of *B. salicifolia* and of *A. aspilioides* were the only ones capable of inhibiting the germination and growth of both test species.

© 2010 Elsevier B.V. All rights reserved.

1. Introduction

Increasing concern about the risks to the environment and human health deriving from the use of synthetic pesticides has led to the current major trend in pest management involving more environmentally friendly agricultural techniques and the search for less hazardous chemicals or biologically based products (Isman, 2006; Hong et al., 2003). Today approximately 0.7% of the agricultural area in Latin America is managed organically, which represents 6.4 million ha under organic cultivation, of which 2.7 million ha are in Argentina alone (Willer and Klicher, 2009). Most organic production in Argentina is of cereals and meat and is destined for export.

Farmland used to grow organic crops must not have been treated with synthetic pesticides and herbicides for at least three years prior to the organic harvest, and weed control is thus based primarily on the use of agricultural techniques (Turner et al., 2007). A more rational way of controlling them may result from identifying natural substances that can control the emergence of weeds (Lin et al., 2006; Xuan et al., 2005). Products of plant origin are frequently based on secondary metabolites, which, in many cases, have a defensive purpose in nature, especially in plants which have few options other than chemical ones for avoiding and combating pests or competitive plant species. Thus, evaluation of plants for pesticide activities is a highly viable strategy for pesticide discovery (Cantrell et al., 2007; Carpinella et al., 1999, 2003, 2005; Palacios et al., 2007; Diaz Napal et al., 2009). In this report, we examine the germination inhibitory properties of 71 plants from Central Argentina against *Avena sativa* and *Raphanus sativus*, as part of a program for the selection of highly active plant species for herbicide development.

2. Materials and methods

2.1. Plant material

Plants were collected in the hills of Córdoba Province, Argentina, from November 2006 to December 2008. Voucher specimens have

* Corresponding author. Tel.: +54 351 4938000x611; fax: +54 351 4938000x611.
E-mail address: sarapalacios@ucc.edu.ar (S.M. Palacios).
[1] These authors are members of the National Research Council of Argentina (CONICET).

0926-6690/$ – see front matter © 2010 Elsevier B.V. All rights reserved.
doi:10.1016/j.indcrop.2010.05.004

Table 1
Germination inhibitory effects of extracts from native plants from Central Argentina.

Plant species	Family	Yield (%)[b]	IG (%)[a]	
			A. sativa	*R. sativus*
Acacia aroma Gillies ex Hook. & Arn.	Fabaceae	29.6	12.36	3.37
Achyrocline satureioides (Lam.) DC.	Asteraceae	4.5	62	1.2
Achyrocline tomentosa Rusby	Asteraceae	4.3	4.28	100
Aloysia citriodora Palau	Verbenaceae	–	81	9
Aloysia gratissima (Gill. & Hook.) Tronc.	Verbenaceae	1.7	17.64	7.78
Ambrosia elatior L.	Asteraceae	2.2	44.18	59.55
Amphilophium cynanchoides (DC.) L.G. Lohmann	Bignoniaceae	7.4	13.79	60.5
Anemia tomentosa (Savigny) Sw.	Schizaceae	1.9	63.64	2.25
Angelphytum aspilioides (Griseb.) H. Rob.	Asteraceae	6.8	100	100
Argemone subfusiformis G. B. Ownbey	Papaveraceae	14.4	13.79	0
Artemisia verlotiorum Lamotte	Asteraceae	3.5	78.16	42.05
Baccharis artemisioides Hook. & Arn.	Asteraceae	2.8	81	29
Baccharis coridifolia DC.	Asteraceae	2.2	81	2
Baccharis flabellata Hook. & Arn.	Asteraceae	7.5	8.04	12.36
Baccharis salicifolia (Ruiz & Pav.) Pers.	Asteraceae	10.2	100	100
Bidens pilosa L.	Asteraceae	4.8	5.8	25.58
Capparis atamisquea Kuntze	Capparaceae	3.15	47.98	42.7
Condalia microphylla Cav.	Rhamnaceae	1.6	40.85	5.62
Cortaderia rudiuscula Stapf	Poaceae	3.5	100	14
Cotoneaster glaucophylla Franch.	Rosaceae	9.1	42.8	1.2
Croton lachnostachyus Baill.	Euphorbiaceae	3.5	22	0
Cuphea glutinosa Cham. & Schltdl.	Lythraceae	–	1.15	21.35
Cynoglosum amabile Stapf & J.R. Drumm.	Boraginaceae	2.7	15.56	20
Dipsacus fullonum L.	Dipsacaceae	5.2	31.03	79.02
Dolichandra unguis-cati (L.) L.G. Lohmann	Bignoniaceae	9.9	14.94	66.7
Dysphania ambrosioides (L.) Mosyakin & Clemants	Chenopodiaceae	3.0	76.2	53
Elaphoglosum lorentzii (Hieron.) H. Christ	Lomariopsidaceae	10.5	87.5	4.71
Eryngium horridum Malme	Apiaceae	4.7	57.35	39.08
Eupatorium buniifolium Hook. & Arn.	Asteraceae	5.2	40	23.3
Eupatorium hookerianum Griseb.	Asteraceae	3.4	100	1.11
Eupatorium viscidum Hook. & Arn.	Asteraceae	2.9	9.19	74.16
Flourensia campestris Griseb.	Asteraceae	11.8	5.8	11.63
Gomphrena pulchella Mart.	Amaranthaceae	3.2	62	5.56
Grindelia pulchella Dunal	Asteraceae	6.7	25.56	6.67
Jarava ichu Ruiz & Pav.	Poaceae	1.5	82.93	17
Jodina rhombifolia (Hook. & Arn.) Reissek	Santalaceae	5.0	77.7	0
Lepechinia meyenii (Walp.) Epling	Lamiaceae	3.8	37.16	17.65
Ligaria cuneifolia (Ruiz & Pav.) Tiegh.	Loranthaceae	4.4	1.14	1.14
Lippia turbinata Griseb.	Verbenaceae	4.8	13.79	29.21
Lithrea molleoides (Vell.) Engl.	Anacardiaceae	7.2	33	30
Mandevilla laxa (Ruiz & Pav.) Woodson	Apocynaceae	2.4	100	58.8
Marrubium vulgare L.	Lamiaceae	3.2	56.97	11.9
Melinis repens (Willd.) Zizka	Poaceae	1.2	52.22	5.95
Melissa officinalis L.	Lamiaceae	4.3	87.5	100
Microliabum candidum (Griseb.) H. Rob.	Asteraceae	3.7	56.52	69.77
Minthostachys verticillata (Griseb.) Epling	Lamiaceae	3.6	81.25	100
Morrenia brachystephana Griseb.	Asclepiadaceae	–	5.74	7.86
Ophryosporus charua (Griseb.) Hieron.	Asteraceae	13.6	20.83	100
Pavonia aurigloba Krapov. & Cristóbal	Malvaceae	2.3	45.71	1.11
Podranea ricasoliana (Tanfani) Sprague	Bignoniaceae	4.5	11.49	100
Porlieria microphylla (Baill.) Descole, OĭDonell & Lourteig	Zygophyllaceae	1.1	85.7	38.89
Pterocaulon alopecuroides (Lam.) DC.	Asteraceae	5.5	76.39	33.71
Pyrostegia venusta (Ker Gawl.) Miers	Bignonaceae	0.9	14.28	3.41
Ruprechtia apetala Wedd.	Polygonaceae	1.9	80	11.1
Schizachyrium condensatum (HBK) Nees	Poaceae	1.9	46.51	7
Senecio madagascariensis Poir.	Asteraceae	4.9	31.76	4.71
Senecio vira-vira Hieron.	Asteraceae	3.9	28.17	44.94
Senna aphylla (Cav.) H.S. Irwin & Barneby	Fabaceae	5.1	42.5	17.04
Sida rhombifolia L.	Malvaceae	2.2	21.34	30.68
Solanum argentinum Bitter & Lillo	Solanaceae	5.4	61.97	19.1
Solanum palinacanthum Dunal	Solanaceae	3.7	5.55	4.44
Solanum sisymbriifolium Lam.	Solanaceae	2.5	1.41	46.07
Sphaeralcea cordobensis Krapov.	Malvaceae	3.1	73.35	31.39
Spharalcea cordobensis Krapov. (mutant)	Malvaceae	1.9	32.94	22.35
Tagetes minuta L.	Asteraceae	2.5	16.85	0
Tripodanthus flagellaris (Cham. & Schltdl.) Tiegh.	Loranthaceae	–	–	3.41
Vernonia mollissima Hook. & Arn.	Asteraceae	2.0	32.39	16.85
Vernonia nudiflora Less.	Asteraceae	7.2	33.33	7.78
Viguiera tucumanensis (Hook. & Arn.) Griseb.	Asteraceae	13.6	64.79	39.32
Wedelia glauca (Ortega) Hicken	Asteraceae	6.4	23.6	25.58
Zanthoxylum coco Hook. f. & Arn.	Rutaceae	1.7	10	88.24

[a] Data represent the mean of three replicates.
[b] Yield of extract per 100 g of plant material.

Download English Version:

https://daneshyari.com/en/article/4514768

Download Persian Version:

https://daneshyari.com/article/4514768

Daneshyari.com