Crop Protection 83 (2016) 56–66

Contents lists available at ScienceDirect

Crop Protection

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

Review

Biology, impact, and management of *Echinochloa colona* (L.) Link

Arslan Masood Peerzada [a], Ali Ahsan Bajwa [b], Hafiz Haider Ali [c], Bhagirath Singh Chauhan [d, *]

[a] Department of Agronomy, University College of Agriculture and Environmental Sciences, The Islamia University of Bahawalpur, Bahawalpur 63100, Punjab, Pakistan
[b] School of Agriculture and Food Sciences, The University of Queensland, Gatton, Queensland 4343, Australia
[c] Department of Agronomy, University College of Agriculture, University of Sargodha, Sargodha 40100, Punjab, Pakistan
[d] The Centre for Plant Science, Queensland Alliance for Agriculture and Food Innovation (QAAFI), The University of Queensland, Toowoomba, Queensland 4350, Australia

ARTICLE INFO

Article history:
Received 18 September 2015
Received in revised form
31 December 2015
Accepted 24 January 2016
Available online 6 February 2016

Keywords:
Allelopathy
Herbicide resistance
Rice
Weed ecology
Weed management

ABSTRACT

Echinochloa colona (L.) Link. is one of the most problematic weeds across the world. It is an annual C_4 summer grass, native to tropical and subtropical Asia, emerged as a serious and persistent threat in 35 cropping systems in more than 60 countries. *E. colona* is reported as an important associated weed species in transplanted and direct-seeded rice. Diverse ecotypes, high seed production, short seed dormancy, rapid growth, competitive potential, allelopathic interaction, and resistance against several herbicides makes it a more adaptable and persistent challenge in various agro-ecosystems. Development of resistance to recommended or higher doses of numerous herbicides, including ametryn, atrazine, bispyribac-sodium, clefoxidym, cyhalofop-butyl, fenoxaprop-p-ethyl, glyphosate, metribuzin, propanil, and triazine, is a serious concern for the farming and scientific community. Crop infestation with resistant *E. colona* biotypes may ultimately increase the weed control cost. Unfortunately, investigations on seed dormancy release, genetic diversity, allelopathic interference, and competitive ability of this weed are inadequate in accomplishing its appropriate control in different environments. Therefore, a comprehensive review is presented here to gather the existing information, to pin point key findings, and to highlight the research gaps in the biology, interference, and management of *E. colona*. Different management options have been discussed in relation with eco-biology of this noxious weed. The potential research endeavours have also been highlighted in order to provide an insight of its existing scenario and to facilitate the future management strategies.

© 2016 Elsevier Ltd. All rights reserved.

Contents

* Corresponding author.
E-mail address: b.chauhan@uq.edu.au (B.S. Chauhan).

http://dx.doi.org/10.1016/j.cropro.2016.01.011
0261-2194/© 2016 Elsevier Ltd. All rights reserved.

1. Introduction

Echinochloa species are usually reported as noxious weeds in several economically important crops around the world (Bajwa et al., 2015a). Among them, *Echinochloa colona* (L.) Link. is recognized as the world's most serious grassweed in many summer crops and vegetables in more than 60 countries (Holm et al., 1991; Rao et al., 2007; Alarcon-Reverte et al., 2014). Globally, it is widely distributed as a noxious weed in tropical and subtropical areas, particularly in Africa, Asia, and Australia (De Wet et al., 1983). Occurrence of *E. colona* has been reported with greater densities in 24 countries in dry-seeded rice, in 12 countries in wet-seeded rice, and also in transplanted rice (Rao et al., 2007; Chauhan and Johnson, 2009). A recent survey in dry-seeded rice in the Indian Punjab reported *E. colona* as the second most dominant weed; reported by 95% of the farmers (Mahajan et al., 2013). It closely mimics rice at the early seedling stage and therefore, transplanted into fields with rice unintentionally (Holm et al., 1991). Prolific seed production, short seed dormancy, quick emergence pattern, and rapid vegetative and reproductive growth under a wide-ranging photoperiod conditions ensure successful population survival that add more persistence towards its weedy nature (Wu et al., 2004; Chauhan and Johnson, 2010a).

E. colona is among the most dominant weed species in rice (Ramachandra et al., 2012) and it may also act as an alternate host for many diseases, insects, and nematodes (Holm et al., 1991). It was declared as top-ranked weed among the 10 most prevalent and abundant weed species reported in the coastal rice fields of Sebarang Perak and Tanjong Karang in Peninsular, Malaysia (Hakim et al., 2011, 2013). Furthermore, its resistance against different herbicides makes it more troublesome in different cropping systems (Caseley et al., 1996; Rao et al., 2007; Valverde, 2007). *E. colona* populations have shown varied degrees of herbicide resistance in the USA, Australia, Asia, Latin America, and Spain (Hoagland et al., 2004; Valverde, 2007; Kim et al., 2000; Widderick et al., 2013). Its biotypes have been found resistant to numerous selective and non-selective herbicides, including glyphosate, atrazine, and metribuzin (Zand et al., 2010; Gaines et al., 2012). However, some carbamate herbicides are well known to synergize the herbicidal activity in *E. colona* (Leah et al., 1994). Recently, Werth et al. (2013) reported that crop infestation with glyphosate-resistant grasses, including *E. colona,* may increase the weed control cost per hectare by Australian $ 40–90 in Australia. Resilient allelopathic and competitive abilities contributes towards its successful survival in different agro-ecosystems (Rao et al., 2007; Gomaa and AbdElgawad, 2012). Furthermore, intensive uses of herbicides have led to evolution of resistance in *E. colona* biotypes, limiting the management options (Leah et al., 1994; Riches et al., 1997; Rao et al., 2007).

Given the importance of this weed, this article is presented to summarize the current state of information on the biology, interference, and management of *E. colona.* The objective of this review article is not only to summarize the existing information logically but also to provide an insight of biology and management interventions with special focus on competitive ability, allelopathic interaction, and herbicide resistance of this weed. Studying the peculiarities in the life history of *E. colona* and its adaptability with the surrounding environment may aid in reforming existing gaps in the current management approaches.

2. Habitat and distribution

E. colona, a summer weed species, is native to tropical and subtropical Asia and is now widespread in the warm regions of Asia, Africa, and Australia, commonly at low altitudes between 30°N and 30°S (Holm et al.,1991; Lazarides, 1980; Michael, 1983). It is the most common and important weed of rice in Latin America, and South and South-East Asian countries including India, Nepal, Philippines, and Pakistan (Gonzalez et al., 1983; Moody, 1986; Shad and Siddiqui, 1996). *E. colona* was first listed in 1924 as a casual neophyte in the flora of Czech Republic and Sweden (Pysek et al., 2012). In Egypt, it has been documented as one of the most dominant weed species in summer crops, fallow lands, and orchards (Hegazy et al., 2004). *E. colona* is usually found through out the west coast and southern states of the USA from Virginia to Missouri, south to Florida and Texas, and South-East California (Chauhan and Johnson, 2009). It is often considered as an annual dominant grass weed of summer crops in Kenya, Japan, and Malaysia (Barnes and Chan, 1990; Michieka, 1991) and is top ranked among the important weed species in Colombia and Sri Lanka (Mele et al., 1997; Bastidas, 1996). In Australia, *E. colona* is considered as the most common grassy weed associated with summer fallows in grain-cropping systems (Widderick et al., 2013) and is widely naturalized in northern, north-western, south-western, south-eastern, and eastern parts including Queensland, New South Wales, Kimberly, Pilbara, Victoria, Australian Capital Territory, Northern Territory, and Christmas Island (Walker et al., 2004; Chauhan and Johnson, 2009, 2010a, 2010b; Werth et al., 2012; Widderick et al., 2013).

E. colona grows and matures very rapidly as the edaphic conditions are favourable in a wide range of ecological niche (Manidool, 1992). It is usually adapted to sunny or partial-shade areas associated with moist or soggy loam, silt, and clayey soils (Manidool, 1992) and predominantly occurs on damp, fertile, and heavy-textured soils receiving seasonal floods (Lazarides, 1980). *E. colona* usually found in cultivated areas, ditches, swamps and wetlands, waterways, waste grounds, water channels, footpaths, margins of lakes and ponds, damp habitat, and barren fields (CABI, 2015). Lack of quarantine measures, materials exchange across borders, and human activities have become the main reasons of its infestation in the cropped areas (Hrusevar et al., 2015). It is listed as a major weed in cassava (*Manihot esculenta* Crantz), cempedak (*Artocarpus polyphema* Pers.), cocoa (*Theobroma cacao* L.), coconut (*Cocos nucifera* L.), coffee (*Coffea arabica* L.), groundnut (*Arachis*

Download English Version:

https://daneshyari.com/en/article/4505596

Download Persian Version:

https://daneshyari.com/article/4505596

Daneshyari.com