

PHENOLOGY OF MAJOR WEEDS IN PADDY FIELD OF POKHARA, NEPAL

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ABSTRACT

Phenological study of top 10 major weed species were carried out in Pokhara, On the basis of important value index (ivi) dominant weeds were: *Ageratum conyzoides* (14.1), *Cynodon dactylon* (13.7), *Ischaemum rugosum* (12.2), *Echinochloa crus galli* (11.5), *Eleocharis atropurpurea* (11.0), *Bidens pilosa* (10.8), *Cyperus rotundus* (10.0), *Cyperus difformis* (9.7), *Echinochloa colona* (8.6) and *Murdania nudiflora* (8.2). Among them 8 monocots and 2 dicots belong to family Poaceae (4), Cyperaceae (3), Commelimaceae (1) and Asteraceae (2) Monocot species were dominating over dicots.

Keywords: Phenology, weeds, paddy, Pokhara

INTRODUCTION

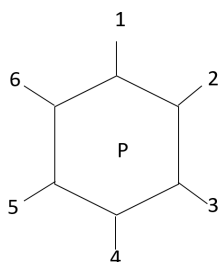
'A weed is a plant growing where it is not desired' Jethrotull (1731) was the first person to use the word weed in this sense in literature in this famous writing on 'Horse Hoeing Husbandry. Paddy field can be colonized by terrestrial, semi-aquatic or aquatic plants (weeds) depending on the type of rice culture, season, soil types, climatic condition, cropping system, cultural practice, irrigation and weed control methods. Even minor change in the eco-climatic, edaphic and agrobiotic factors or tillage treatments cause important changes in weed associations. The number of species that comprise the major portion of the weed flora in any rice field is usually less than 10, and rarely more than 3 or 4 species (Ahmed and Moody 1980, Moody and Drost 1983).

In Nepal biology of weeds is in emerging stage where as in developed countries considerable literature is available on the biology of weeds including characteristic,

phenology and life cycle of many species (Bhowmic 1993). Our knowledge of the biochemistry, morphology, physiology, phenology and ecology of specific weeds is needed for the development of superior control methods. Without knowledge of weed biology, weed management is not effective. Hence the present investigation was carried out in weed phenology of major weed species in paddy field of Pokhara valley.

Materials and Methods

Field experiments were carried out at the paddy field of Pokhara valley during June to December and the experiment was repeated twice for accurate data. On the basis of important value index the ten major weeds were selected for their phenological study. As the paddy crop remains in the field up to November-December, the phenophases up to December have been recorded. The weeds were brought to the laboratory from the paddy field for critical observation on phenology. Following stages of phenology were recorded.



Where, 1 = Germination, 2= vegetative growth, 3 = flowering, 4 = fruiting, 5= seed maturation, 6= death and p= perennation.

When a phenophase was noticed in about 10% individuals under observation, the phenophase was considered to be initiated and phenophase was considered to be in peak when it occurred in more than 80% individuals.

RESULTS

On the basis of important value index (IVI) the major 10 dominant weed species of the paddy field of Pokhara valley were: *Ageratum conyzoides* L. (14.1), *Cynodon dactylon* (L) pers. (13.7), *Ischaemum rugosum* salisb. (12.2), *Echinochloa crus-galli* (L.) Beauv. (11.5), *Eleocharis atropurpurea* (Retz.) Kunth (11.0), *Bidens pilosa* L. (10.8), *Cyperus rotundus* L. (10.0), *Cyperus difformis* L. (9.7), *Echinochloa colona* (L) Link (8.6) and *Murdania nudiflora* (L) Brenan (8.2). Among them 8 monocot and 2 dicot belonging to family Poaceae (4 spp), Cyperaceae (3 spp), Commelinaceae (1 sp) and Asteraceae (2 spp) (Table 1).

Table 1: Major weeds in paddy field of Pokhara

Weed species	IVI
<i>Ageratum conyzoides</i>	14.1
* <i>Cynodon dactylon</i>	13.7
* <i>Ischaemum rugosum</i>	12.2
<i>Echinochloa crus-galle</i>	11.5
<i>Eleocharis atropurpurea</i>	11.0
<i>Bidens Pilosa</i>	10.8

* <i>Cyperus rotundus</i>	10.0
<i>Cyperus difformis</i>	9.7
<i>Echinochloa colona</i>	8.6
<i>Murdania nudiflora</i>	8.2

othres (56) species 190.2= 300

* The world's worst weeds (Holm *et al.* 1991)

The phenological behaviour of Ten major weed species noted in the paddy field are presented in phenological diagram (Table 2). When the field flooded and puddled for transplanting paddy in mid June to late June, the water temperature was higher than the 19°C required for germination. Germination of weed seeds and emergence from propagules started soon after paddy transplanting. Emergence continues for about two months (Table 2).

Among the 10 major weeds germination started in the month of July. Eight species in early and two species in late July. Likewise similar pattern of vegetative growth, occurs up to early September. But in *Ageratum conyzoides* vegetative growth completed on late August. Whereas in *Echinochloa crus-galli* and *Cyperus difformis* it takes place up to late September. Similarly early flowering occurs in *Ageratum conyzoides* and *Eleocharis atropurpurea* in late September. In late September all weeds were in flowering condition whereas in early October all were in fruiting stage. Maturation of seeds in all species starts from late September and peaks in late October. After seed production death occurs in all weed species except in *Cynodon dactylon* and *Cyperus rotundus* in them perennation takes place (Table 2).

Table 2: Phenograms of Ten Major weed species in Paddy field of Pokhara

Weed Species	June	July		August		Sept		Oct		Nov	Dec
		Early	Late	Early	Late	Early	Late	Early	Late		
<i>Ageratum conyzoides</i>											
<i>Cynodon dactylon</i>											
<i>Ischemum rugosum</i>											
<i>Echinochloa crus-galli</i>											
<i>Eleocharis atropurpurea</i>											
<i>Bidens pilosa</i>											
<i>Cyperus rotundus</i>											
<i>Cyperus difformis</i>											
<i>Echinochloa colona</i>											
<i>Murdania nudiflora</i>											

E- Early L- Late



1 = seed germination , 2 = Vegetative growth 3 = Flowering 4 = Fruiting 5 = Seed Maturation 6 = Death - Absent p = perennation

DISCUSSION

Knowledge of phenology of weeds is an essential prerequisite for any planing of their control. The ecological requirement of *E. crus-galli* and *I. rugosum* are very similar to those paddy and these two species are very difficult to distinguish from paddy plant in the early stage of growth, as they mimic to paddy plants. They often been misused and mature at the same time as the paddy crop do. They contaminate the crop seeds as well as soil and create trouble in the succeeding year. In general, the more a weed species resembles a crop plants in ecological requirement and morphological similarity the more difficult it is to control by hand weeding

(Thapa 2004).

On the basis of IVI value the dominant weed species were *Ageratum conyzoides*, *Cynodon dactylon*, *Ischaemum rugosum*, *Echinochloa crus-galli*, *Eleocharis atropurpurea*, *Bidens pilosa*, *Cyperus rotundus*, *Cyperus difformis*, *Echinochloa colona* and *Murdania nudiflora*. Dominance of monocot species over dicot, in the present study, corresponds the findings of Dangol (2002), Shrestha (1996) and Thapa (2004).

All weed seeds germinated within one month of paddy transplantation. Such massive seed germination and emergence from propgules within one month after transplantation was due to well prepared field for paddy transplanting. De Datta and Baltazar (1996) reported that many

weeds have almost identical growth habits and growth requirements with paddy and the practices which benefit paddy will also benefit weeds.

Generally weeds of paddy fields produce small but larger number of seeds which enrich soil seed bank and come to life by germination whenever the situation is favourable. Yamasue and Ueki (1983) reported that the heavier seeds had shorter dormant period than the lighter seeds. The lighter seeds should be less competitive with rice plant because of their small food reserve and late emergence in the field. Larger number of weed seed with small size, thus favour mass germination at the early stage of paddy transplant. Kneebone (1972) has mentioned that seedling vigour and seed size is probably the most important criteria among all the selective criteria. Those weed seeds that germinated along with the paddy were more aggressive for competition than the weed which appear later on.

Rao (1983) stated that weed seeds that germinate under the similar condition and same time as crop seeds are the most persistent and successful. Some of the weeds, which germinate at later stage of paddy growth, cannot compete with early flushing weeds and paddy plants for light and nutrients and cause no or very less effect to crop yield. Labrada and Parker (1994) and Thapa and Jha (2002) also reported similar finding.

Most of the weed studied started flowering and fruiting within 30-50 days after germination. Gutterman (1985) reported that almost all of the prevalent weed species are able to flower within a short time period after germination Mercado (1979) reported that flowering in most annual weeds start as early as five weeks after germination and coincides with the period of rapid leaf and shoot production. Duration of reproductive phase is quite long and flowers

are successively produced. Similar pattern of behavior is observed in the flowering and fruiting of the paddy field weed in the present study. Most of the maturation of weed seed occurs in the month of October along or one week earlier than the paddy crops.

Generally, weed growth occurs within 42 days after transplanting of paddy crop and they propagate by seeds and propagules or both. Perennial weeds are most serious problem in paddy to control. Over all phenological study of weeds can predict the population and right time of weeding to check yield losses of paddy crop. However it can be concluded that weed should be control at proper time to check reduction in crop yield and they must be removed before flowering and fruiting to reduce the source of seeds in soil seed bank for next years.

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