

Phenology, biomass and associated species of alligator weed at Biratnagar, Nepal

Bhabindra Niroula

Department of Botany, P.G. Campus, Tribhuvan University, Biratnagar, Nepal
E-mail: niroulab@gmail.com

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Known as 'Jaljamboo' in Nepal, alligator weed (*Alternanthera philoxeroides* Griseb.), a native plant of South America (Brazil) is an invasive alien species (IAS) in wetlands in many parts of the tropics and subtropics (Mitsch & Gosselink, 2000). The weed was first reported from Biratnagar area in 1994 by Siwakoti and Varma. It has invaded wetlands of Nepal's Terai, threatening the existence of native plant species. It thrives well in nutrient rich new habitats in absence of the natural competitors (Tiwari *et al.*, 2005; Siwakoti, 2006; Jha, 2007). This weed is a herb, up to 100 cm long. Stems simple or branched, solid or fistular, longitudinally striated, with a creeping or floating root base. Leaves are 3-8 cm long, oblong-obovate, attenuated at base. Flowers are white, bisexual solitary and terminal, bractless peduncled with ovoid or globose shining heads. It propagates vegetatively as well as by seeds.

Realizing its impact on wetland flora and its possible control through biomass utilization (Majid, 1998-99); present work deals with the associated species, phenology and the biomass of the alligator weed in different habitats. Pollution/nutrient loaded water bodies – Bhattapokhari, ditch, and Singhia river of Biratnagar, Nepal were selected for the present study. Biratnagar (Lat. 26°20'N & Long. 87°16'E, alt. 72 msl) has alluvial soil, tropical monsoonic climate with three distinct seasons *viz.*, winter (November-February), summer (March-June), and rainy (July-October) in a year (Tab. 1).

The weed was sampled randomly using 10 quadrats of 50×50 cm² size at monthly intervals from January to December, 2009. Collected samples were washed, brought to the laboratory and oven-dried to constant weight at 80°C. Productivity was determined as per Trivedy and Goel (1984). Associated species were monitored in the field and identified. Phenology was recorded as per Lodhiyal *et al.* (1998).

It was a competitor with 12 associated species- free floating (*Azolla imbricata* (Roxb.) Nakai, *Eichhornia crassipes* (Mart.) Solms, *Lemna minor* L., *Pistia stratiotes* L., *Spirodela polyrhiza* (L.) Schleid.); and emergent (*Ludwigia perennis* L., *Panicum psilopodium* Trin., *Paspalidium punctatum* (Brum.) A. Camus, *Polygonum barbatum* (L.) Hara, *Ranunculus scleratus* L., *Sacciolepis interrupta* (Willd.) Stapf and *Typha angustifolia* L.).

The weed underwent perennation during winter and sprouted/germinated from late winter to early summer. Vegetative growth continued up to early rainy season. Flowers were observed from April to August. Fruiting and seed maturation occurred from August to October and the weed underwent senescence in late October (Fig. 1).

Table 1. Meteorological data of study area (2009).

Months	Temperature ($^{\circ}$ C)		Rainfall (mm)	Relative humidity (%)
	Maximum	Minimum		
January	23.4	11.4	0.0	98.7
February	28.1	12.0	0.0	90.8
March	32.5	15.5	4.4	71.5
April	35.5	22.7	17.0	68.7
May	33.8	23.2	491.3	78.3
June	33.7	25.6	296.4	86.2
July	33.0	26.5	280.1	87.9
August	32.5	26.0	455.8	89.5
September	34.2	25.0	58.0	84.5
October	32.2	21.1	117.1	83.5
November	29.0	15.2	0.6	84.3
December	24.5	11.3	0.0	96.4

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec



1= Germination, 2= Vegetative growth, 3= Flowering, 4= Fruiting, 5= Seed maturation, 6= Senescence & P= Perennation.

Figure 1. Phenological observations on alligator weed.**Table 2.** Monthly biomass (g/m^2) (mean \pm SE) of alligator weed in Bhattapokhari (I), ditch (II), and Singhia river (III).

Site	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
I	0	024.2	56.0	60.6	66.6	78.6	82.0	146.6	276.0	410.8	414.6	12.0
		± 7.6	± 17.7	± 19.1	± 20.8	± 24.8	± 25.9	± 46.3	± 87.2	± 129.9	± 131.1	± 3.7
II	144.0	187.2	376.0	1056.0	1160.0	1188.0	2608.0	2300.0	1072.0	336.0	144.0	88.0
	± 45.5	± 59.1	± 118.9	± 333.9	± 366.8	± 375.6	± 824.7	± 727.5	± 338.9	± 106.2	± 45.5	± 27.8
III	4.6	8.4	17.0	19.0	34.6	32.4	17.1	0	0	0	0	0
	± 1.4	± 3.4	± 5.3	± 6.0	± 10.9	± 10.2	± 5.4					

Tender shoots of the weed are used as pot herb and fodder during summer. Monthly dry biomass of alligator weed in different water bodies are given in table 2. Favourable months for maximum dry biomass production were as: Bhattapokhari-November, ditch-July and Singhia river-May. Average annual standing crop and productivity was highest in ditch (888.25 g/m^2 and $2520.0 \text{ g/m}^2/\text{yr}$) followed by Bhattapokhari (147.9 g/m^2 and 144.6

g/m²/yr), and least in Singhia river (19.01 g/m² and 30.0 g/m²/yr), respectively. Differences in the habitats and hydrological regimes of the water bodies might be the possible reasons for disparity in growth and dry matter production. The author is grateful to Dr. S. Jha, Professor and Head, Department of Botany, P.G. Campus, T.U., Biratnagar, Nepal for lab facilities and encouragements. IOST, Dean, T.U., and U.G.C. Nepal are acknowledged for study leave and partial financial support, respectively.

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