Review Article

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AGROECOLOGY OF MAJOR CROPS AND THEIR WEEDS IN BANGLADESH

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The climate, soil types, agricultural seasons and the major crops of Bangladesh are briefly introduced. The interaction of crop duration and the climatic factors are graphically presented. Agroecological conditions over which the major crops and their associated weeds are grown have been mentioned. The important weeds of major crops are commented on and a crop-wise list is appended. The species of great importance common to the whole country include *Cyperus rotundus, Cynodon dactylon, Echinochloa crusgalli, Echinochloa colonum, Chenopodium album, Fimbristylis miliacea, Cyperus iria* and *Eicchornia crassipes.* Two parasitic weeds newly introduced in the country, *Striga densiflora* and *Orobanche indica* are causing severe damage to sugarcane and mustard respectively.

Key words: Weed-list, Crops, Agroecology, Bangladesh.

Introduction

Bangladesh is situated between latitudes of 20.5° and 26.5°N, and longitudes of 88.5° and 92.5° E. Although the country lies north of equator with the larger half of its climate is mainly sub-tropical. About 90% of the land remains 38 m above sea level. More than 87% of the area is an alluvial plain which are formed by the deposition of silts from some of the biggest rivers, the Ganges, the Brahmaputra, the Meghna and their tributaries.

Two major agricultural seasons -- Kharif (summer) and Robi (winter) exist. Robi extends from October to March and it is dry season marked with insignificant amount of rainfall, low humidity and moderately low temperature. Kharif, on the other hand, is a wet season with high rainfall, humidity and temperature.

A number of crops are grown during the Kharif and Robi seasons. Among them, rice is the most important food crop, since boiled rice is the staple food of the teeming millions. Four kinds of rice -- aus (summer rice or direct-seeded upland rice), transplant aman, (autumn rice), boro rice (transplanted spring rice) and deep water rice (floating rice) are grown. Wheat is the second important cereal crop of the country. Jute, the golden fibre, is the most important cash crop. Tea is a plantation crop which grows on hills and tillas. Important sugar crop is sugarcane. Potato, mustard and pulses are the other important crops.

The interaction between crops and weeds depends on a number of factors such as crop cultivars, cultivation methods, and climatic and soil conditions (Hoque *et al* 1978; Satter 1987). Different species of weeds thus grow with different crops. But no systematic study has been done in the country on the weeds which usually grow with different crops except a few studies concentrating on locality basis (Mian *et al* 1970a & b;Mian 1971; Baksha *et al* 1979a & b; Razzaque and Ali 1979; Mamun *et al* 1987). The information on the agroecology of major crops and that of weeds competing with the crops are also not gathered systematically. An attempt was, therefore, undertaken to report the agroecological situations over which the major crops are grown and the important weeds which commonly grow with these crops.

Agroecology of crops and weeds. The duration of major crops and the climatic conditions (temperature, humidity and rainfall) they experience are presented in Figure 1. The mean annual temperature varies between 24 to 30°C. The average rainfall is 206.7 mm. About 95% of the annual rainfall is distributed over the months from April to October and about 58% of this is available during only the three months -- June, July and August. The variation in day length over seasons is not large. The shortest day length consists of 10 h in the winter while the longest one of 14 h occurs during the hottest months of summer (Ahmed 1965).

The agroecological situations of Bangladesh are highly congenial for vigorous growth of diversified weed flora. Maximum weed growth occur in the Kharif season. Although comparatively less weed growth occur during Robi season, the intensity of weed infestation and the toll of weeds on crop yields are quite significant (Mian *et al* 1970a). The land elevation, type of culture and the intensity of management over which the crops are grown are presented in Table 1. All these give a clear picture of the habitats of the major crops and focus on the agroecological situations over which a particular weed community is built up in a particular crop.

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Table 1

Agroecological situations in which major crops are grown

Crop	Topography	Type of culture	Agroecological situations* Degree of land preparation	Fertilization	Irrigation	Weed control	Insect control	Disease control	Remarks
Summer rice	Medium	Dry, direct seeded	Optimum	Rare	No	Occasional	No	No	
Autumn rice	Low/medium	Wet, transplanted	Reduced	Regular	No	Occasional	Rare	Rare	
Deep water rice	Very low	Dry, direct seeded, flooded	Optimum	Rare	No	No	No	No	
Spring rice	Low/very low	Transplanted	Reduced/zero	Regular	Occasional	No	Rare	Rare	
Modern rice**	High/medium	Transplanted	Optimum	Regular	Regular	Regular	Regular	Regular	
Jute	High/medium	Dry, direct seeded	Optimum	Rare	No	Occasional	No	No	
Wheat	Medium	Dry, direct seeded	Optimum	Rare	Occasional	No	No	No	
Sugarcane	High	Dry, direct seeded planted	Optimum	Rare	Occasional	Occasional	Rare	No	In ratoon crop zero tillage used
Mustard	Medium	Dry, direct seeded	Reduced	No/Rare	No	No	No	No	
Potato	Medium	Dry, tuber planted	Optimum	Rare	Occasional	No	No	No	
Pulses	Medium	Dry, direct seeded	Reduced	No/Rare	No	No	No	No	In relay cropping zero tillage used
Tea	Tila	Dry, clone planted	Reduced	Rare	No	No	Rare	Rare	

* Terms/words included under columns are explained in the text; ** Modern rice includes high yielding rice varieties developed by Bangladesh Rice Research Institute, Gazipur, Dhaka which can be grown as summer, autumn or spring rice.

* Definition of agroecological situations as mentioned in Table 1

Land topography. Tila -- Small hills or hillocks, surface cut into terraces. High -- Places where rain water does not stand and flood water does not reach. Medium -- Places where rain water could be retained by constructing levee around the field and occasionally flood water may reach. Low -- Places where rain water accumulates very easily and flood water is a problem. Very low -- Usually the basins where residual flood water remains during the winter.

Type of culture. Dry, direct seeded -- The land is prepared in dry condition and seeds are sown directly over dry soil. Dry, Direct seeded, flooded -- Seeds are sown in dry condition but flood water introduces into the field in the later whereby crop plants elongate with the rise of flood water. Wet, transplanted -- The land is prepared in wet condition and seedlings are transplanted in puddled soil. Dry, sett planted -- The land is prepared in dry condition and stem cuttings of sugarcane called setts, are planted either in trenches or in furrows. Dry, tuber planted -- The land is prepared in dry condition and tubers are planted in plough furrows.

Land preparation. Optimum -- The tilth is optimum for the crop. Reduced -- Not prepared up to the optimum tilth. Zero -- Land is not prepared but the crop is relayed or broadcast on the undisturbed stubble of previous crops.

Fertilization. Regular -- Fertilizers are generally used. Rare -- Only the rich farmers use fertilizers sometimes, if they do at all.

Irrigation. Regular -- Irrigation is done properly. Occasional -- Generally not irrigated but it is done on availability of water sources near the crop field.

Weed control. Regular -- Crops are generally weeded, at least one weeding is done.

Insect and disease control. Regular -- Crops are generally treated with insecticides and fungicides at least one time for each. Rare -- The farmers in general do not use any insecticide and fungicide but when the crop is heavily infested with pests they sometimes use pesticides.

Weeds of major crops. Until present, any country-wide survey on the weeds have not been done in Bangladesh. Some surveys have been done on specific areas in few crops only. Mian (1971) first published a list of 88 weed species under the title of "Weeds of East Pakistan" which was based on the study of a specific area. Talukder and Ali (1976) in a study found 129 weed species belonging to 39 families to grow in the arable jute land of Bangladesh. Baksha *et al* (1978a & b) identified 78 monocot and 97 dicot weeds in paddy fields of Dhaka district. A total of 32 species including a parasitic weed, *Striga densiflora* were reported as weeds of sugarcane fields (Razzaque and Ali 1979). In a survey conducted in two agroecological zones -- Old Brahmaputra Floodplain, and Young Brahmaputra and Jamuna Floodplain of the country on boro rice, wheat, mustard and lentil, a total of 92 weed species belonging to 28 families were found to infest the crops (Mamun *et al* 1993). Mamun (1991) identified and prepared a manual of 102 weed species which are usually found in crop fields, roadsides, swamps, banks of pond and homestead areas. A checklist of 350 Bangladeshi weeds with their ecological classification and crop-weed association has been published in a text book of Weed Science (Karim and Kabir 1995). Based on these literature and other crop-weed competition studies conducted in different crops in the country (Akber *et al* 1964; Akber 1967; Akber 1968; Khan *et al* 1976; Hashem *et al* 1976; Islam 1981; Azad *et al* 1983; Gaffer, 1984a & b; BRRI 1985; Karim *et al*1986; Mamun *et al* 1986; Rahman 1986; Sarker 1987; Ali *et al* 1994) along with the personal observation of the authors which were gathered at the time of weed surveys conducted in four agroecological zones of the country during 1991-1994 (BAU 1995), weed species growing in association with major crops have been sorted out crop-wise and are presented in the accompanied list (Table 2). Although the ranking of the weed species in a particular crop could not be quantified using Summed Dominance Ratio, they are arranged according to their importance as weed in that particular crop based on published information and personal observation. It is hoped that this would serve as an inventory of predominant weeds of major crops in Bangladesh.

Although each region of the country has a particular set of weeds causing severe infestation, in general the species of greatest importance common to the whole country includes *Cyperus rotundus, Cynodon dactylon, Echinochloa crusgalli, Echinochloa colonum, Chenopodium album, Fimbristylis miliacea, Cyperus iria* and *Eicchornia crassipes.* Two parasitic weeds are newly introduced in the country, *Striga densiflora* and *Orobanche indica* causing severe damage to sugarcane and mustard respectively in some part of the country.

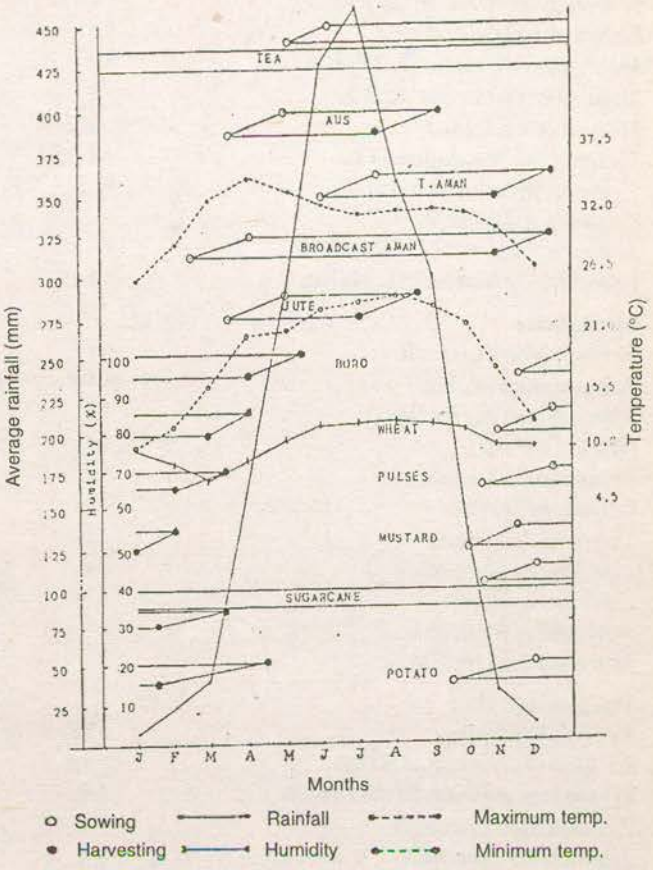

Fig 1. Crop duration, average rainfall, temperature and humidity of Bangladesh (average of 1975-76 to 1984-85).

Table 2

List of predominant weeds with their degree of seriousness in a particular crop growing with major crops in Bangladesh.

Scientific name & authority	Occurence in crops*
Summer rice	
Echinochloa crusgalli (L.) P. Beauv	+++
Echinochloa colonum (L.) Link	+++
Cyperus rotundus L.	+++
Paspalum commersoni Lamk.	++
Eleusine indica (L.) Gaertn.	+++
Cynodon dactylon (L.) Pers.	+++
Cyperus iria L.	++
Cyperus difformis L.	++
Fimbristylis littoralis Gaud.	++
Digitaria sanguinalis (L.) Scop.	+
Eclipta prostrata (L.) L.	+
Murdania nudiflora (L.) Brenan	+
Autumn rice	
Scirpus mucronatus L.	+++
Leersia hexandra Sw.	++
Ludwigia prostrata	++
Cyperus iria	+++

(Cont'd...)

(Table 2 cont'd...)

Cynodon dactylon	++
Digitaria sanguinalis	++
Eclipta prostrata	++
Amaranthus spinosus	++
Amaranthus viridis	++
Portulaca oleracea L.	++
Pulses (Chickpea and lentil)	
Chenopodium album	+++
Vicia hirsuta	+++
Vicia sativa	+++
Cyperus rotundus	+++
Cynodon dactylon	+++
Gnaphalium luteo-album	++
Parapholis incurva	+
Eleusine indica	++
Dactyloctenium aegyptium	+
Solanum torvum	++
Celosia argentia L.	+
Tea	
Borreria hispidia K. Schum.	+++
Mikania scandens (L.) Willd.	+++
Mimosa pudica	+++
Imperata cylindrica	+++
Cyperus rotundus	+++
Scopavia dulcis L.	++
Bhumea spp.	++

* +, Occurs as a component of weed flora but not a serious problem by itself; ++, Occurs as a weed of considerable importance; +++, Occurs as a serious weed at one or more locations.

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