

WEED DISTRIBUTION AND INFESTATION IN CHINA

Tang Hong Yuan

Shanghai Academy of Agricultural Science, Shanghai 201106, China

Summary. The distribution and infestation of weeds in China depend on temperature, water (rainfall or irrigation), soil, light duration and cropping system in various locations at different latitudes, longitudes and altitudes. There are some representative weeds in different zones.

- A. Tropic zone: *Dactyloctenium aegyptiacum*, *Hedyotis costata*.
- B. South subtropics zone: *Ageratum conyzoides*, *Paspalum conjugatum*, *Alopecurus aequalis*.
- C. Subtropic zone: *Leptochloa chinensis*, *Alternanthera philoxeroides*, *Alopecurus aequalis*.
- D. Warm temperate zone: *Descurainia sophia*, *Acalypha australis*, *Amaranthus retroflexus*.
- E. Temperate zone: *Avena fatua*, *Polygonum convolvulus*.
- F. North temperate zone: *Galeopsis bifida*, *Avena fatua*.

There are 53 million hectares of weed infestation areas in China. The total grain yield loss caused by weed infestation was estimated at 15 billion kg per year.

INTRODUCTION

Surveying method of 7-degree damage by weeds according to weed coverage was developed by R.J. Froud-Williran and R.J. Chancellor in 1982 for investigating weed infestation in wheat fields in south England (1). The surveying method of 5-scale weed infestation in crop fields in China according to relative coverage, height and density of weeds was established by the author in the study carried out in 1981-1992, more than 30 thousand field plots had been surveyed in 300 counties belonging to 28 provinces or cities, for investigating the composition, distribution and infestation of field weeds in China according to different latitudes, longitudes, altitudes, soil and cropping system. The results of research work on weed distribution and infestation in China may serve as a basis for the practice of weed control, especially for making strategy on herbicide development and industry in China (2).

MATERIAL AND METHOD

Weed infestation degree was estimated by visualisation method according to the relative coverage of weeds (R.C. = weed coverage/crop coverage), relative height of weeds (R.H. = weed height/crop height) and relative density of weeds (R.D. = weed density/crop density). The infestation degree of weeds were classified into 5 scales as follows:

- 1 degree: a few weeds are present but do not damage crop.
- 2 degree: light damage R.C. = 5% - 10% (R.H. = 50%-100%)
R.C. = 10% - 30% (R.H. < 50%)
- 3 degree: middle damage R.C. = 10% - 30% (R.H. = 50%-100%)
R.C. = 30% - 50% (R.H. < 50%)
- 4 degree: serious damage R.C. = 30% - 50% (R.H. = 50% - 100%)
R.C. > 50% (R.H. < 50%)
- 5 degree: very serious damage R.C. = 50% - 100% (R.H. = or > 50% (Table 1)

Table 1. The data for rating weed infestation level by visualisation method

Infestation level	Relative height (R.H.)	Relative coverage (R.C.)	Relative density (R.D.)
1	50%-100% <50%	5%> 5%-10%	
2	50%-100% <50%	5%-10% 10%-30%	25%-50%
3	50%-100% <50%	10%-30% 30%-50%	50%-100%
4	50%-100% <50%	30%-50% 50%-100%	
5	>50%	>50%	

RESULT AND DISCUSSION

According to the data from investigation, the distribution and infestation of field weeds in China depend on the temperature, water, soil, light duration and cropping system at different latitudes, longitudes and altitudes. There are some typical representative weeds in different areas.

The areas at latitude 18-22 N. degrees. It belonging to tropic zone where the mean annual temperature is between 22-25°C, the cropping system is rice-sugar rotation. The representative weeds are *Dactyloctenium aegyptiacum*, *Hedyotis costata*, *Eupatorium odoratum*, *Sphenochlea zeylanica*, there are no winter crop and related weeds.

The areas at latitude 23-26 N. degrees. The representative weeds are *Ageratum conyzoides*, *Jussiaea repen*, *Paspalum conjugatum* and some winter weeds *Alopecurus aequalis* and *Malachium aquaticum* in east flat and hill field belonging to south subtropic zone where the mean annual temperature is 20-21°C, the annual rainfall is more than 1000 mm, the cropping system is rice-sugar-wheat, rape or green manure rotation with three crops in a year.

The representative weeds are *Echinochloa crusgalli*, *Cyperus difformis*, *Leptochloa chinensis*, *Sagittaria pygmaea*, *Potamogeton distinctus*, *Alopecurus aequalis* and *Malachium aquaticum* in YunGui plateau areas belonging to subtropic zone where the elevation is 1000-2000 M. The mean annual temperature is 14-18°C and cropping system is rice-wheat or rape or green manure rotation with two crops a year.

The representative weeds are *Avena fatua*, *Thlaspium arvense*, *Senecio vulgaris*, *Escholtzia ciliata* and *Polygonum nepalense* in high mountain area belonging to temperate zone where the elevation is 2500 M. The mean annual temperature is between 2-7°C, the annual rainfall is 800-1000 mm. the cropping system is potato-barley or rape rotation with one crop a year.

The areas at latitude 27-34 N. degrees. The representative weeds are *Leptochloa chinensis*, *Paspalum distichum*, *Alternanthera philoxeroides*, *Digitaria sanguinalis*, *Chenopodium album*,

Plenary papers

Cyperus difformis, *Echinochloa crusgalli*, *Monochoria vaginalis*, *Chenopodium serotinum*, *Rotala indica*, *Sagittaria pygmaea*, *Alopecurus aequalis* and *Malachium aquaticum* in the YanZeiver basin areas belonging to the subtropic zone, from east coast to Sichuang Province, where most fields are located in low elevation, flat and hilly lands, the mean annual temperature is 14-18°C, the annual rainfall is about 1000 mm, the cropping system is rice-wheat (barley, rape) or cotton-green manure rotation with two crops a year.

The representative weeds are *Avena fatua*, *Thlaspum arvense*, *Senecio vulgaris*, *Galium aparine* and *Polygonum nepalense* in west Sichung-Tibet Plateau areas and some high mountain areas where the elevation is 2000-3000 M. The mean annual temperature is 5-7°C, it belongs to temperate zone, the cropping system is wheat or barley-potato with one crop a year.

The areas latitudes 33-40 N. degrees. From Huai river to Great Wall, the representative weeds are *Descurania sorphia*, *Eleusine indica*, *Acalypha australis*, *Chenopodium serotinum*, *C. album*, *Setaria viridis*, *Polygonum lapathifolia*, *Amaranthus retroflexus*, *Convolvulus arvense*, *Galium aparine* and *Capsella-bursa-pastoris* in HuangHe, HaiRiver and Hai river basin areas, belonging to warm temperate zone, where the mean annual temperature is 10-13°C, the annual rainfall is 500-800 mm, the cropping system is cotton-corn-soybean(peanut)-wheat rotation with three crops every two year.

The representative weeds are *Convolvulus arvense*, *Avena fatua*, *Chenopodium album*, *Setaria viridis* in Huangttu plateau areas belonging to temperate zone where the elevation is about 1000 M. The annual rainfall is below 500 mm, the cropping system is corn-sorghum-wheat (barley) rotation with one crop a year.

The representative weeds are *Avena fatua*, *Polygonum convolvulus*, *Elsholtzia ciliata*, *Galeopsis bifida* and *Lepydodictis holosteoides* in QiuHai plateau areas belonging to temperate, north temperate zone where the elevation is 2400-3000 M. The mean annual temperature is 5-7°C, the annual rainfall is about 500 M. The cropping system is wheat (barley)-rape-potato with one crop a year.

The representative weeds are *Avena fatua*, *Chenopodium album*, *Convolvulus arvense*, *Phramitis communise*, *Polygonum aviculare* and *Scirpus planiculmis* in some irrigation fields of desert in XinJiang, GanSu basin areas belonging to warm temperate zone and temperate zone where the mean annual temperature is about 10°C, but day is high, night is low, the annual rainfall is below 100 mm, the field crops depend on irrigation system, the cropping system is rice-cotton-wheat rotation with one or two crop a year.

The areas at latitude 40-50 N. degrees. These areas are situated outside Great-Wall, in Liaoning, JiLin and HelongJiang, where the mean annual temperature is 2-8°C, the elevation below 500 M, the annual rainfall is about 500 mm. The cropping system is wheat-soybean-corn-rice rotation with one crop a year, the representative weeds are *Avena fatua*, *Polygonum convolvulus*, *P. bungeanum*, *Chenopodium album* and *Potamogeton distinctus*.

The areas at latitude 50-53 N. degrees. These areas are situated in north HelongJiang where the mean temperature is below 0°C. The major crops are potato and rape, the representative weeds are *Galeopsis bifid* and *Avena fatua*.

Plenary papers

There are 53 million hectares of weed infestation areas in China, among them, 17 serious weeds were distributed all over or most of areas in China, such as *Echinochloa crusgalli*, *Digitaria sanguinalis*, *Chenopodium album*, *Polygonum lapathifolia*, *Avena fatua*, *Alopecurus aequalis*, *Cyperus rotundus*, *Potamogeton distinctus*, *Scirpus planiculmis*, *Juncellus serotina*, and more 30 major weeds such as *Galium aparine*, *Malachium aquaticum*, *Stellaria media*, *Portulaca oleracea*, *Leptchloa chinensis* and some weeds only infestation in partial areas such as *Dactyloctenium aegyptiacum*, *Hedyotis costata* in tropic zone areas in south China, the *Galeopsis bifid*, *Polygonum convolvulus* in north China. The total grain yield loss cause by weed damage was estimated at 15 billion kg per year.

REFERENCES

1. Froud-Williams, R.J. and Chancellor, R.J. 1982. Weed Res. 22, 163-171.
2. Tang Hong Yuan 1992. The field weeds in China. pp 1-281.