WARM-ZONE ANNUAL GRASSES

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Summary

Eleven species of warm-zone annual grasses are present in New Zealand, four species of which have reached significance in late spring crops, lawns, waste areas and, to a limited extent, pastures. Few objective data are available on their full distribution and economic significance, but there is little doubt that they are increasing rapidly as the result of more cropping and the use of broadleaf herbicides and they extend beyond the limits of defined warm-zone areas. In general, they show greater susceptibility to pre-plant soil-incorporated and pre-emergence herbicides but with few exceptions they are not controlled as seedlings in crops by post-emergence materials.

THE INTRODUCTION and spread of warm-zone annual grasses in New Zealand are not well documented and until 1962 only fleeting references to these species occur in the *Proceedings* of our Society. For instance, Healy (1952) makes no reference to these species but McKee (1955) refers to barnyard grass as being a problem in maize in the Gisborne area. It was not until 1962 that trial data were presented on control and reference made to the growing importance of warm-zone annual grasses.

Table 1 lists the botanical and common names of these grasses and their importance in New Zealand. All are members of the Panicae with the exception of crowfoot grass. All are annual species germinating in spring, summer and early autumn with peak germination in late spring/early summer period. Seed is produced in abundance but is not viable for long periods (possibly one to two years only).

The map (Fig. 1) delineates the warm-zone areas in New Zealand which are defined as frost-free areas at least for the growing period of the warm-zone crops. The warm-zone annual grasses are not confined to

TABLE 1: WARM-ZONE ANNUAL GRASSES

Digitaria ischaemum†	Smooth summer grass
*Digitaria sanguinalis**	Summer grass
*Echinochloa crus-galli**	Barnyard grass
*Eleusine indica**	Crowfoot grass
Panicum capillare†	Witchgrass
*Panicum dichotomiflorum**	Smooth witchgrass
Setaria geniculata	Knot-root bristle grass
Setaria glauca	Yellow bristle grass
Setaria verticillata	Rough bristle grass
Setaria viridis†	Green bristle grass

*Species of national importance
†Species of localized importance

these areas but at present appear capable of growing in many areas with high summer temperatures.

The agronomically important species are increasing rapidly and responding significantly to applied fertilizer in warm-zone crops such as maize, soyabeans, sorghum and tomatoes and, if broadleaf weeds are not present, in such crops as potatoes, peas, beans, and garden brassicas. They appear as weeds in perennial crops such as lucerne, grapes and pastures and in lawns, playing greens and waste areas. Causes for their rapid increase appear many—the use of broadleaf specifics, taking more than one

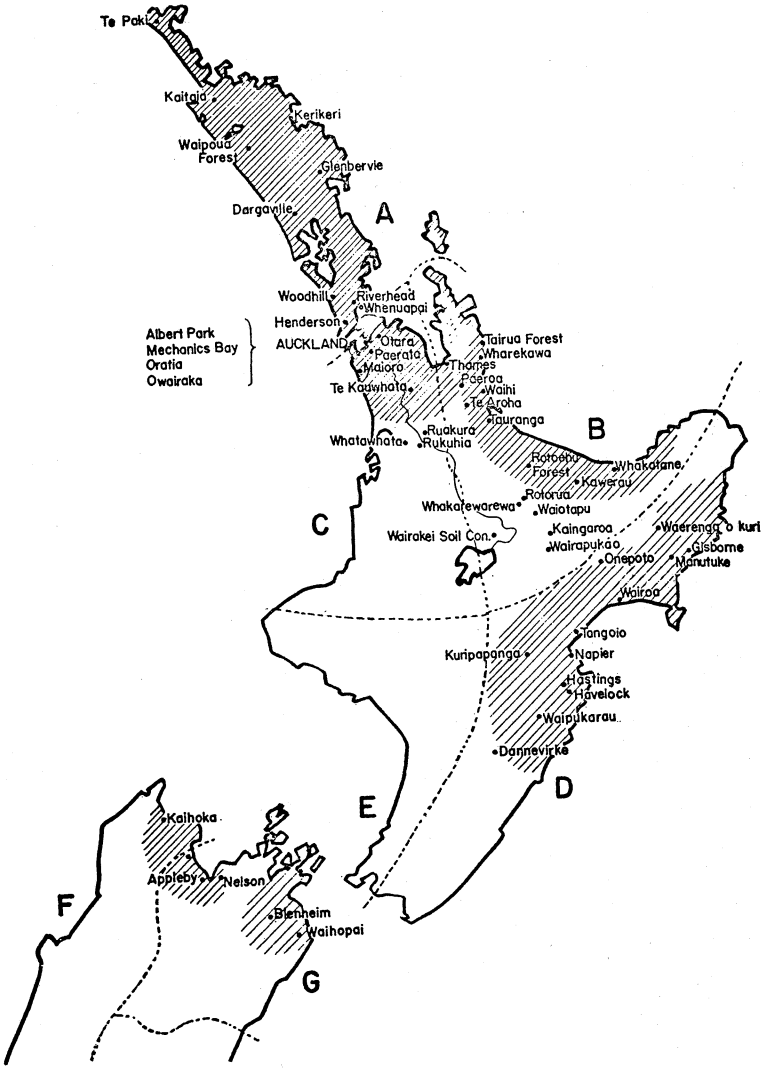

FIG. 1: *The warm-zone areas of New Zealand.*

crop out of pasture, increase in warm-zone crops, little or no tillage for crop production, pasture deterioration due to overgrazing, insect attack or herbicide damage and destroying competitive effect of vegetation in waste areas by mechanical means, fire or herbicide application.

MAIN SPECIES

Crowfoot Grass

This wiry, relatively unpalatable species first appeared in gateways, loading ramps, farm races, access headlands, and the like, owing to its propensity to withstand severe treading. It is now more widespread and a frequent component of crops, pastures and waste areas. Stock, if forced, will graze the upper leaves leaving a crown within which seed-heads may be formed. It does not appear drought susceptible and possibly increases as a result of dry weather. It is most likely to be confused with narrow-leaved carpet grass (*Axonopus affinis*).

Barnyard Grass

Barnyard grass is more usually an arable plant establishing under wetter conditions than other members of the Panicae and hence tends to be more localized (Gisborne-Whakatane area). Seed germinates over a wide temperature range and optimum germination occurs at soil moisture levels of 70 to 90% at pH 7. Fresh seed is dormant for at least three months and may germinate from as deep as 6 in. with optimum germination occurring in the top 0.5 to 1 in. layer. Even though seed germinates from depth, the growing point is always at the surface.

Barnyard grass is a most competitive species capable of forming pure associations and its growth habit is allied to that of the crop in which it grows. For instance, in onions it may be relatively prostrate, while in maize the seed-heads may reach 6 ft or more high.

Smooth Witchgrass

Present botanical descriptions do not cover all growth forms of this species and it shows similar variability in growth forms as barnyard grass. Worldwide, smooth witchgrass is not as important as barnyard grass and the same ecological detail is not available. However, in New Zealand it appears to be developing as a worse weed problem than barnyard grass owing to its preference for drier situations, its ability to survive under drier conditions in arable areas and waste areas, and its greater tolerance to most herbicides.

Summer Grass

This is a most prevalent warm-zone species, locally abundant in pasture, arable crops, waste areas, playing greens and lawns. In crops it is possibly less competitive than barnyard grass and smooth witchgrass as it seldom grows more than 2 ft high and is often completely smothered by the more dominant growth of the former species. Summer grass possibly germinates at higher temperatures than the other species and is possibly more drought intolerant. It may flower within six weeks of germination if excessively dry conditions follow moist conditions suitable for germination. Under glass, germination may occur as early as July and as late as May.

CONTROL

(Only selective control in crops is dealt with.)

Full data are not available for the grass herbicides, particularly inter-species tolerance. In general, seedlings prior to emergence are more susceptible but often soil moisture and high organic matter content limit the success of pre-emergence and pre-plant soil-incorporated (PPSI) materials.

PRE-PLANT SOIL-INCORPORATED

Dithiocarbamates and Thiocarbamates

Excellent control at rates of 3 to 6 lb except under extremes of high organic matter content, cold temperatures and excessive rainfall when initial control may be good but persistence is not adequate. Optimum conditions are moist soils of less than 5% organic matter.

Substituted Anilines

These materials are generally more reliable than the previous materials under adverse conditions. With increased rates of application (trifluralin (1 lb) nitralin (1.5 lb) and benfluralin (3 lb)), they are satisfactory up to 10% organic matter without loss of selectivity, whereas with increase in rates of the dithiocarbamates and thiocarbamates some selectivity is lost, particularly under high rainfall.

PRE-EMERGENT MATERIALS

Carbamates mainly chlorpropham (4 lb); not over satisfactory, as these chemicals are unreliable under hot or excessively wet conditions.

Amides: Full tolerance data are not available for all materials. Prynachlor (2 lb), alachlor (2 lb), propachlor (3 lb), delachlor (2 lb) and diphenamid (4.0 lb) are very adequate under moist conditions and low organic matter content but may prove totally unreliable under dry conditions. Carbetamide (3 lb) and pronamide (1.5 lb) appear satisfactory under the same conditions as the above but more data are required on crowfoot grass.

Ureas: At selective rates these materials are not adequate and their unreliability is greater with increasing organic matter content. The methoxy ureas are less toxic than monuron and diuron but possibly show greater effect owing to less dependence on suitable moisture conditions.

Diazines: Very effective as a group, pyrazon (4 lb) being marginal except under suitable conditions of adequate moisture and low organic content.

Triazines: Atrazine shows less activity than simazine, the methyl mercapto triazines and the butyl amino materials, witchgrasses and summer grasses proving more tolerant than barnyard grass and the bristle grasses. In general, these materials are unreliable at rates less than 2 lb and organic matter content above 5 to 10%. Cyprozine (1 lb) and cyanazine (3 lb) are not adequate.

Benzonitriles (5 lb) plus dichlobenil or chlorthiamid are satisfactory with possible exceptions of crowfoot grass.

Benzoics: Chloramben (4 lb) is good only under precise moisture conditions—little or no rain and this material fails completely.

Chlorthal (8 lb plus) is adequate only in soils of less than 1% organic matter.

POST-EMERGENCE MATERIALS

Seedlings one-leaf stage or smaller.

Bipyridyls: Both paraquat (2 oz) and diquat (4 oz) are adequate where crop tolerance is satisfactory. Crowfoot grass is possibly the most resistant species.

Amides: The contact action of prynachlor (2 lb) and alachlor (2 lb) is adequate on very young seedlings actively growing under good growth conditions—smooth witchgrass being more tolerant than the other species. The residual activity of these materials is not adequate to hold the grasses, particularly under wet conditions and high organic matter content, but they are still the soundest recommendations under these conditions. Pentanochlor (4 lb) checks plants present at the time of application but fails to control subsequent germination.

Methoxy ureas: Normally the contact action of these materials at rates up to 2 lb is adequate, linuron showing greater activity than chlorbromuron (2 lb) and metobromuron (2 to 3 lb). Chloroxuron (4 lb) is marginally adequate. Again the witchgrasses are the more tolerant species. On high organic matter soils, residual activity of these materials is totally inadequate.

Triazines: Atrazine at 4 to 6 lb plus surfactant or lower rates plus non-aromatic oils is adequate on barnyard grass and the bristle grasses. At the 1 lb rate it is totally inadequate on all grasses. The methyl mercapto and butyl amino materials show greater activity on witchgrasses or summer grasses but are not adequate at selective rates. Cyprozine (1 lb) shows about the same activity as atrazine. Cyanazine (3 lb) initially is superior but its short persistence under high rainfall may allow subsequent germination to occur.

Diazines: These materials are generally adequate except pyrazon (4 lb).

2, 2-DPA: Rates of 1.5 to 3 lb are adequate on plants present but not persistent enough for subsequent germination.

ACKNOWLEDGEMENTS

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