QUEENSLAND DEPARTMENT OF PRIMARY INDUSTRIES
DIVISION OF PLANT INDUSTRY BULLETIN No. 344

EFFECT OF NITROGEN FERTILIZER ON THE EMERGENCE OF WILD OAT (AVENA LUDOVICIANA)

By F. B. WATKINS, B.AGR.SC.*

SUMMARY

Field application of nitrogenous fertilizers to plots infested with wild oat seed gave increased emergence of wild oat seedlings over emergence on untreated infested plots.

Introduction

During recent years, the occurrence of wild oat (chiefly *Avena ludoviciana* Dur) on the Darling Downs of south-eastern Queensland has increased, particularly on areas used for annual winter crops. Seasonal conditions over this time have not been generally conducive to weed germination prior to crop sowing, so little mechanical control has been practised and the weed has increased in density in crops. Emergence of wild oat after rains in late summer and autumn is generally low even under ideal conditions, because of the dormancy characteristics of the species. Induction of germination after late-summer rains, or even after sowing rains, would lead to considerable destruction of seedlings and a possible progressive reduction in wild oat populations.

Sexsmith and Pittman (1963) noted that the early spring application of ammonium nitrate increased wild oat (*Avena fatua*) density from 304 to 1,612 plants per sq yd. Thurston (1963) and Mears (1965) have also recorded the possibility that nitrogen in either the artificial or the organic forms may stimulate germination of *A. fatua*. S. R. Klose (personal communication) noted that the density of *A. ludoviciana* increased from 171 seedlings per sq yd in the absence of fertilizer to 614 seedlings per sq yd in plots receiving 2 cwt urea per acre.

Experimental

A field experiment was conducted in 1965 to explore this question further. The experimental area belonged to the Cecilvale series of grey clay soils and had been used for successive cropping to linseed. Seed counts taken from soil samples (0–6 in. depth) over the experimental site indicated a potential wild oat density of 740–1,380 plants per sq yd.

* Division of Plant Industry, Queensland Department of Primary Industries.

Three types of nitrogenous fertilizer (urea, sulphate of ammonia, and calcium ammonium nitrate) were applied at four levels (0, 23, 46 and 92 lb nitrogen per acre). These applications were made either on January 8, 1965, or on May 18, 1965, the calcium ammonium nitrate being used only in May 1965. This factorial design was arranged in randomized blocks with three absolute replications.

Results and Discussion

The fate of the nitrogen applied in January was investigated in May, and soil analysis showed that the nitrogen was still in the surface 4 in., although mainly in the ammonia form. Total available soil nitrogen ranged from 8 p.p.m. in the control plots to 142 p.p.m. in the plot with the heaviest urea application.

The season was abnormally dry, and insufficient rain fell during the period January–July for sound conclusions to be drawn concerning effects on early-season emergence. Seedling counts were made on August 6 and August 16, 1965, and the significant effects from the first determination are presented in Table 1.

TABLE 1

EFFECT OF NITROGEN LEVEL AND TIME OF APPLICATION ON EMERGENCE OF WILD OATS
Plants/sq yd at August 1, 1965

Nitrogen Level (lb/ac)	Time of Application		Mean
	8.i.65	18.v.65	
0	..	..	74·1
23	160·0	180·3	170·2
46	239·1	193·1	216·1
92	286·3	155·6	221·0
Mean	228·5	176·3	..

Necessary differences for significance—

	5%	1%
Times of application ..	33·6	45·0
Nitrogen levels	41·2	55·1
Treatment combinations	58·3	77·9

All fertilizer treatments gave a significant increase in wild oat emergence, but there were no significant differences between the types of fertilizers used. The stimulatory effect of fertilizer was greater from the January application, except at the lowest level of nitrogen application. Less than half the potential wild oat population had emerged at the time of the second count.

The increasing use of nitrogenous fertilizers on the Darling Downs to replenish soil nitrogen appears to open a further avenue of control of wild oat. The low leaching characteristics of both the black earth and the grey clay soil types enables nitrogen to be applied early with little risk of serious nitrogen loss. On present indications, such applications would produce increased emergence of existing wild oat seeds, thus permitting greater weed control by cultivation.

The mode of action of nitrogenous fertilizers in stimulating wild oat germination and/or emergence is not yet known, but investigations are being carried out.

Acknowledgement

Acknowledgements are made to the Australian Wheat Industry Research Council for financial support, to Mr. W. J. Keeley, Brookstead, on whose property the experiment was conducted; to Mr. P. B. McGovern (Chief Biometrician); to the Agricultural Chemical Laboratory for soil nitrogen analysis; and to Mr. S. R. Klose for suggestions.

REFERENCES

MEARS, A. D. (1965).—Wild oats, poor relations in wheat. *Agric. Gaz. N.S.W.* 76:287–92.

SEXSMITH, J. J., and PITTMAN, V. J. (1963).—Effect of nitrogen fertilizers on germination and stand of wild oats. *Weeds* 11:99.

THURSTON, [JOAN M.] (1963).—Wild oats. In *Rep. Rothamsted Exp. Stn* for 1962: 93–4.

(Received for publication October 13, 1965)