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Time of application of solid nitrogen fertilisers.

M G. Mason

TIME OF APPLICATION OF SOLID NITROGEN FERTILISERS

M.G. Mason, Research Officer

The current recommendations for time of application of solid nitrogen fertilisers such as urea, ammonium nitrate and sulphate of ammonia are:-

Zone A: These fertilisers should be applied as close to seeding as possible.

Zone B: As for zone A except on very sandy soils which are very prone to leaching, where application can be delayed 2 - 3 weeks.

Zone C: Applications should be delayed about 3 weeks after seeding.

These times of application do not always give the best results every year because there are many factors affecting the optimum time of application, which cause the variation from one time or situation to another. If N - P compound fertilisers are being used, since they supply the phosphorus needs as well as the nitrogen, they must be drilled with the seed.

Probably the most important factor determining the best time of application for the other solid nitrogen fertilisers is the incidence of rain soon after application. If they are applied at seeding and this is followed immediately by heavy rain, then there is a good chance that much of the nitrogen may be lost by downward leaching before the plants can develop a root system to take up the nitrogen. The likeli hood of such heavy rains is greater in the higher rainfall, zone C, where the growing season is only short e.g. zone A it is desirable that the crop has the nitrogen available as soon as possible and in these lower rainfall areas there is less chance of leaching.

Trials

In zone A the results of twenty four trials were examined for the effect of time of application of the nitrogen fertiliser. In 46% of the cases, application made at seeding was superior to all other times of application. In 29% of the cases there was no real difference between applications at seeding or up to two weeks after seeding. This means that applications made at seeding gave at least equal to best yields in 75% of all cases in this zone. Only 8% of the cases gave best results with applications later than six weeks after seeding.

In zone B the results of forty two trials were examined. In 45% of the cases, application made at seeding was superior to all other times of appliction. In another 26% of the cases, application at seeding gave equal to best results. This means that applications made at seeding gave at least equal to best yields in 71% of all cases in this zone. In only 17% of all cases were applications later than 3 weeks after seeding alone superior to other times of application. However, in another 24% of the cases applications made later than 3 weeks after application were equal in effectiveness to applications made at seeding. Therefore applications 3 weeks or later after seeding gave equal to best yields in 41% of all cases.

In zone C the results of 39 trials were examined. In only 33⅓% of all cases was application at seeding alone superior to all other times of application. In addition application at seeding gave yields equal to best in 23% of all cases. This means that applications made at seeding gave at least equal to best yields in 56% of all cases. Applications made 2 - 4 weeks after seeding gave equal to best yields in 46% of all cases. Best results with applications later than four weeks were superior to all other times of application in 20.5% of all cases.

Summary

These observations show that the recommendations for zones A and B are fairly conclusive i.e. applications should be made at seeding or as close to seeding as possible. Later applications, up to about 6 weeks after seeding, may still give profitable responses, but are not likely to be as profitable as applications closer to seeding. Also applications should not be made too long "before" seeding as this may lead to losses of nitrogen.

However, in Zone C the situation is not quite as clear cut as there is considerable variation in this zone. There is room for further work in this zone and perhaps the recommendation could be made for applications to be made in the first 3 or 4 weeks after seeding. However, work with split applications in 1969 gave promising results and suggests that in parts of zone C this practice may be more profitable than a single application. This would presumably be due the fact that not all the nitrogen is applied at once where there is a danger of loss of a considerable proportion. Instead the risk is spread over a period and nitrogen is supplied over a longer part of the growing period for use by the plants.

Split Applications

In 1969 six trials to investigate split applications of urea or ammonium nitrate on either wheat or Dampier barley were carried out in zone C. In addition there were two of these trials in the wetter more sandy part of zone B (Badgingara and Eneabba). The results of these trials are summarised in Table 1, where the means for all trials have been taken for comparison. The split applications have been compared with the recommended time for a single application and also with the single time of application which gave the best result in each case, i.e. if the best time of application has been predicted correctly everytime and represents the best possible result with a single application in these situations.

Table 1

	Mean Yield (Bus/ac)	
	For split ½ at seeding + ½ later (Total Eq. 100 lb. Urea)	For Spit 2/3 at seeding + 1/3 later (Total Eq. to urea 150)
Recommended time for single application	26.5	29.4
Best time for single application	27.5	30.2
Part at seeding + Part 3 weeks after seeding	26.8	29.6
" " " + " 6 " " "	26.5	30.0
" " " + " 9 " " "	26.9	30.9
" " " + " 12 " " "	24.1	30.0
" 3 weeks A.S. + " 6 " " "		28.1
" 3 " " + " 9		29.8

The split applications gave relatively better performances at the higher rate of application (equivalent to 150 lb urea/ac). If the recommended time of application is after seeding then there would be no extra cost of application due to the split application because the first application could be made during the seeding operation. At the 100 lb/ac rate, the split applications with second application 3,6 or 9 weeks after seeding, were equal to or better than the recommended time of a single application but not as good as the best result obtainable with a single application. At the 150 lb/ac rate all split applications with part applied at seeding and part later were better than the single applications at the recommended times. In addition, split applications with the second lot applied 6,9 or 12 weeks after seeding were equal to or better than the best single application. Since it is unlikely that in every case the optimum time for a single application would be chosen, these results with split applications are very promising. These results are averages from the trials carried out and in several of the trials the split applications were considerably better than single applications at the high rate of application and therefore the use of split applications warrants further consideration.

These results were obtained in a dry season and it would be interesting to see the results obtained in a more normal year.

Table 2 sets out the number of times single applications made at each time of application gave a profitable or now profitable response in trials where time were compared. In any one trial a number of times of application may give a profitable response, but one time of application usually results in a more profitable increase than others. From the figures in this table it is quite clear that applications made at times other than the optimum time, can often still give profitable responses.

Table 2

Zone	A		B		C	
Time of Application	Profitable Response	Not Profit-able	Profit-able Response	Not Profit-able	Profit-able Response	Not Profit-able
At seeding	22	4	35	2	38	9
2 weeks after seeding	12	4	14	1	11	2
3 weeks after seeding	6	0	11	3	24	5
4 weeks after seeding	4	0	8	0	11	2
5 " " "	9	5	8	1	3	1
6 " " "	7	1	6	1	21	5
7-8 " "	13	3	14	4	14	1
9 " " "	4	2	2	0	16	2
10 " " "	9	9	11	2	11	1
12 " " "	4	1	2	4	16	5