

PART II

Research Undertaken for the Forestry Commission at Universities and other Institutions

NUTRITION EXPERIMENTS IN FOREST NURSERIES

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Isobutylidene diurea (IBDU). The slow-acting N fertiliser IBDU made in Japan (*Rothamsted Report* for 1966, pages 43–44) was again tested on grass, and on conifer seedlings and transplants (of Sitka spruce, *Picea sitchensis*).

The experiments with one-year Sitka spruce seedlings, started in 1966 at Wareham Nursery in Dorset and Kennington Extension Nursery near Oxford, compared two granule sizes of IBDU (0.8–1.4 and 1.5–2.4 mm, both with 30% N) with formalised casein (11% N) and “Nitro-Chalk” (21% N). Four amounts of each were tested. IBDU and formalised casein were dug in early in February before sowing; “Nitro-Chalk” was split into four topdressings applied at the beginning of June, July, August and September. In 1967 similar experiments were started at the same nurseries on transplanted 1-year seedlings uniformly manured in the seed-bed.

TABLE 45

EFFECT OF FOUR NITROGEN FERTILISERS ON HEIGHT OF SITKA SPRUCE SEEDLINGS
AND TRANSPLANTS AT TWO NURSERIES IN 1967

small N = mean of 6 and 12 g N/sq. yd
large N = mean of 18 and 24 g N/sq yd

Nursery and Treatment	Height (in)			
	Seedlings		Transplants	
	small N	large N	small N	large N
<i>Wareham</i>				
without N	0.4		5.1	
IBDU (0.8–1.4 mm)	1.0	1.2	9.9	10.6
IBDU (1.5–2.4 mm)	1.3	1.8	8.9	9.8
Formalised casein	1.6	1.9	10.2	10.2
“Nitro-Chalk”	1.8	2.9	9.1	10.0
Standard error	±0.17	±0.17	±0.44	±0.44
<i>Kennington Extension</i>				
without N	1.4		10.4	
IBDU (0.8–1.4 mm)	2.4	2.3	13.4	13.7
IBDU (1.5–2.4 mm)	2.6	2.5	12.9	14.2
Formalised casein	2.5	2.5	13.7	15.4
“Nitro-Chalk”	3.0	3.1	13.2	15.2
Standard error	±0.13	±0.13	±0.48	±0.48

At Kennington Extension the summer rain was close to the 21-year average, but Wareham had 5 in. in May (the average is 2.2 in.). Table 45 shows, for *seedlings*, responses to N were large at both nurseries; the best treatments increased seedling height 7-fold at Wareham and more than doubled it at Kennington Extension. The finer IBDU (0.8–1.4 mm) was least effective, coarser IBDU (1.5–2.4 mm) behaved like formalised casein, but—in contrast to 1966—“Nitro-Chalk” was much better than the other three sources of N.

All large amounts of N doubled the height of *transplants* at Wareham; at Kennington Extension the best treatments increased height by nearly a half. Differences between sources of N were smaller and less consistent than with seedlings, and “Nitro-Chalk” was no better than the slow-release forms.

On the light sandy soil of Wareham all nitrogen treatments decreased soil pH. The sites had received a small basal dressing of lime, and on the plots without nitrogen the pH was 5.0 (in CaCl₂). In the seed-bed experiment (after two cropping seasons) the small amounts of N of the slow-release fertilisers decreased pH by at least half a unit and the larger amount of N by a whole unit or more. “Nitro-Chalk” also decreased pH, but to a lesser extent. The pH values in the transplant experiment (after one season) followed a similar trend but were less consistent. There is ample evidence that Sitka spruce seedlings grow best at pH 4.5 (Benzian, *Bull. For. Commn, Lond.* (1965), No. 37, Vol. 1), and the large decreases in soil reaction associated with nitrogen dressings make it difficult to interpret the results. On the sandy loamy soil of Kennington Extension (pH of the site is about 4.2) the decreases were very small—ranging from 0.1 to 0.3 pH unit.

TABLE 46
EFFECT OF FOUR DIFFERENT NITROGEN FERTILISERS ON DRY MATTER
OF SITKA SPRUCE SEEDLINGS AND % N IN CROP AT DIFFERENT STAGES
OF GROWTH IN TWO NURSERIES, 1967

Nursery and Treatment	Dry matter of tops (mg/plant)			% N in dry matter		
	July/ Aug.	Aug./ Sept.	Nov.	July/ Aug.	Aug./ Sept.	Nov.
<i>Wareham</i>						
Without nitrogen	8	16	24	(1.3)*	(0.9)	(1.2)
IBDU (0.8–1.4 mm)	25	92	154	2.0	1.1	0.9
IBDU (1.5–2.4 mm)	29	124	226	2.2	1.5	1.1
Formalised casein	30	139	234	2.4	1.4	1.1
“Nitro-Chalk”	26	146	257	2.6	1.8	1.3
<i>Kennington Extension</i>						
Without nitrogen	29	112	149	2.2	1.4	1.2
IBDU (0.8–1.4 mm)	41	172	314	2.7	2.0	1.6
IBDU (1.5–2.4 mm)	40	184	369	2.5	2.0	1.8
Formalised casein	40	179	324	2.6	1.9	1.7
“Nitro-Chalk”	40	208	416	2.6	2.3	1.9

* Brackets indicate there was not enough material for accurate analyses.

The speed at which nitrogen is released from the four fertilisers was followed during the growing season by sampling *seedling* tops (cut at ground level) at five times (July, early and late August, September and November). In Table 46 the results at first and second sampling dates are averaged, as are those at the

third and fourth. At Wareham the finer IBDU (0.8–1.4 mm) produced plants with smallest weights and smallest N concentrations, presumably because N was lost during the very wet May. The coarser IBDU behaved like formalised casein. Except for dry weights at the first sampling, "Nitro-Chalk" was better throughout. At Kennington Extension differences between fertiliser forms were small, particularly effects on N concentrations. At Wareham the largest N concentrations (with "Nitro-Chalk") were less than the smallest (with IBDU 0.8–1.4 mm) at Kennington Extension.

In a small trial with *seedlings* at Wareham still coarser IBDU (2.5–4.0 mm) was better than the 1.5–2.4 mm fraction, but the plants were smaller than those given "Nitro-Chalk":

g N/sq yd	Height of seedlings (in.)		
	Without N: 0.8		With "Nitro-Chalk"
	With IBDU:		
	1.5–2.4 mm	2.5–4.0 mm	
12	2.6	3.3	4.3
24	3.7	4.0	4.8

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