NUTRITION EXPERIMENTS IN FOREST NURSERIES: SLOW-RELEASE FERTILIZERS FOR CONIFER SEEDLINGS

By BLANCHE BENZIAN, J. BOLTON and G. E. G. MATTINGLY

Rothamsted Experimental Station, Harpenden, Herts.

Extract from Rothamsted Annual Report for 1964

Conifer seedlings, which make much of their growth in the late summer, are often grown on light sandy soils where soluble salts are rapidly lost by leaching. Under these conditions 'slow-release' fertilizers may have special merits, and the very wet spring and early summer of 1964, which probably aggravated leaching losses, gave a good opportunity for testing sparingly soluble sources of N, P and K. Because of the prolonged dry spell that followed, seedlings remained small.

In experiments with Sitka and Norway spruce seedlings, a PK compound fertilizer made from superphosphate and potassium chloride was compared with potassium dihydrogen phosphate and also with potassium metaphosphate; all fertilizers were applied in March before sowing. In a fourth treatment the PK compound was supplemented by potassium nitrate added in three summer top-dressings. (All plots had basal dressings of 'Nitro-Chalk' and kieserite; on the potassium nitrate plots the 'Nitro-Chalk' dressings were correspondingly decreased.)

At the end of June, plants treated with potassium metaphosphate were greenest and most vigorous; they remained best throughout the season, closely followed by plants given potassium nitrate. Seedling tops were analysed at four times between early July and November. The percentage P in plants given metaphosphate consistently exceeded the percentage P in plants given other fertilizers. Comparing the PK fertilizers only, percentage K in the plants was always least where PK compound only was given; percentage K in plants from other plots increased in the order: potassium dihydrogen phosphate, PK compound plus potassium nitrate, and potassium metaphosphate. By November plants on the potassium nitrate plots had overtaken those given potassium metaphosphate. Table 17 shows measurements made at the end of the growing season and scores for colour in September. The two species behaved similarly.

Magnesium ammonium phosphate is sparingly soluble, and so has potential use as a slowly acting source of N, P and Mg. Because it supplies three nutrients, designing experiments to compare it with other materials is difficult, while at the same time defining the shapes of nutrient response curves. Preliminary work in 1964 indicated some of the experimental problems, but suggested that this salt may be a useful fertilizer on very light soils. In a second experiment with Sitka spruce, a 'standard fertilizer', consisting of 'Nitro-Chalk', superphosphate, potassium chloride and kieserite, was compared with a compost made from bracken and hopwaste (applied at 15 lb./sq. yd.), and also with magnesium ammonium phosphate used at three rates. As much basal K as was supplied by the standard fertilizer was given with all rates of magnesium ammonium phosphate; but this fertilizer supplied more P and Mg at all the rates tested and a little more N at the largest. The plants on the plots with the two larger rates

Table 17

THE EFFECTS OF P AND K FERTILIZERS ON 1-YEAR SEEDLINGS AT WAREHAM IN 1964

Species and treatment	Rate of application (g element/ sq. yd.)		Height (ins.)	Dry matter of tops (mg./ plant)	Colour* score	P (%) (in dry matter of seedlings)	K (%) (in dry matter of seedlings)
	P	K					
Sitka spruce							
No fertilizer	0	0	0·8	53	3	0·11	0·43
Superphosphate only	9	0	1·0	78	4	0·18	0·28
PK compound (from super + KCl)	9	9	1·0	71	2	0·14	0·36
Potassium dihydrogen phosphate	9	12	1·0	81	1	0·15	0·58
PK compound + KNO_3	9	15	1·3	120	0	0·18	1·05
Potassium metaphosphate	9	12	1·5	136	0	0·23	0·86
Norway spruce							
No fertilizer	0	0	0·9	68	4	0·10	0·30
Superphosphate only	9	0	1·2	96	4	0·16	0·24
PK compound (from super + KCl)	9	9	1·2	100	3	0·16	0·30
Potassium dihydrogen phosphate	9	12	1·4	122	1	0·12	0·41
PK compound + KNO_3	9	15	1·6	144	0	0·14	0·83
Potassium metaphosphate	9	12	1·7	151	0	0·24	0·70

* For the purple and yellow discoloration typical of K-deficiency (0 = no discoloration).

of magnesium ammonium phosphate grew faster throughout the season than those on 'standard fertilizer' or compost plots, but showed signs of severe potassium deficiency, reflecting the early loss of K by leaching. In height and dry matter the plants with compost were roughly midway between those with standard fertilizer, and those with magnesium ammonium phosphate, though much better in colour than either. Plants given compost and standard fertilizer had much smaller percentage P (at the last sampling date) than plants given magnesium ammonium phosphate. Plants given compost had much larger percentage K than those given any other treatment.