The influence of rates of nitrogen and potassium application on the cooking quality of four potato varieties

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Summary

The influence of four nitrogen and four potassium levels on sloughing, mealiness, softness, colour and discoloration of cooked potatoes was investigated with the varieties Aristo, Irene, Libertas and Ijsselster, grown on twelve trial fields on sandy soils. Both these types of fertilizer had an influence on all cooking properties but the response varied considerably between varieties. In general, the variety Aristo responded most strongly, whereas Libertas usually showed the weakest reaction. The effect of potassium was to produce in all varieties a linear decrease in sloughing, mealiness and softness. The response to nitrogen was more varied in that Aristo responded with a nearly linear decrease, whereas the other varieties, especially Libertas, showed a weaker reaction. Nitrogen decreased yellowness and increased discoloration after cooking, whereas potassium had the opposite effect. Nitrogen was especially harmful with respect to discoloration after cooking if the potassium level was low. Field influence was very strong with regard to textural properties, but only slight with regard to colour and discoloration after cooking.

Introduction

As shown by Schippers (1961), application of nitrogen and potassium influenced texture, colour and discoloration of cooked potatoes, but these influences were somewhat variable. To obtain more information about these factors, similar experiments were conducted, but with a greater number of varieties and on a greater number of experimental fields. This paper describes results of experiments on cooking quality while the results relating to yield and specific gravity appeared in another paper (Schippers, 1968).

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Material

In 1961, twelve experimental fields were laid out in the province of Drenthe, The Netherlands, with the medium-early varieties Aristo and IJsselster and the late varieties Irene and Libertas. The fields were located on potassium deficient sandy soils of strongly varying moisture retaining capacity. Base fertilizers given were 100 kg P₂O₅ and 80 kg MgO/ha. Experimental fertilizer treatments were 0, 80, 160 and 240 kg N/ha, given half as nitrate and half as ammonia, each combined with 0, 100, 200 or 300 kg K₂O/ha, given as sulphate. These combinations were distributed in a randomized block with each plot subdivided into four subplots for a random allocation of varieties. All fields were in duplicate. Because of differences in soil moisture the fields could not be planted within a short period and planting dates varied from 31 March on the driest field to 26 April on the heaviest soil. Nine of the twelve fields, however, were planted within a fortnight. Because of cold weather during the spring, the biggest difference in development ‘between fields’ on the 1st of June was not more than 10 cm. These differences reflected differences in planting date and 3 weeks later they had disappeared completely.

Methods

The crop was stored at about 10°C and a R. H. ranging mainly between 80% and 90%, and during the winter months samples from all plots were cooked and judged three times. Since the number of cooking samples was very great (12 x 4 x 4 x 2 x 3 x 4608), some of the quality characteristics which are normally part of the quality assessment were omitted. The judgment was limited to colour, discoloration after cooking, sloughing, mealliness and softness. Scoring was done by two judges on a scale of 1 to 4, 1 being ‘no’ and 4 ‘strong’. Colour, however, was judged on a scale from 1 (white) to 3 (cream) to 6 (deep yellow). The term ‘softness’ is used instead of the term ‘consistency’ used previously, and ‘sloughing’ is used to describe ‘disintegration of the outer layer’. The variety Aristo was cooked and judged three times from 27 Nov. to 21 Dec., the variety IJsselster from 15 Jan. to 8 Feb., the variety Irene from 26 Feb. to 21 March and the variety Libertas from 22 March to 14 April. Sampling was at random within fields. The samples were steamed until done, as determined by pricking with a needle, and put on plates. Judgment of quality was made after about a quarter of an hour. Sixty-four samples were judged daily in four sessions.

Results

Owing to the large number of samples only a selection of the most important results will be given.