EFFECT OF CUTTING AND GIBBERELLIN TREATMENT ON AUTUMN-GROWN SEED POTATOES FOR SPRING PLANTING

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Summary, Zusammenfassung, Résumé. p. 191

1. INTRODUCTION

Previous work (SLOMNICKI, 1961a) indicated that length of dormancy was the main factor limiting the use of autumn-grown seed of most varieties for the spring season. As considerable promise was shown by known varieties with short dormancy and a short to medium growing period, a programme of breeding for these characters was commenced (SLOMNICKI, 1961b). Simultaneously, experiments on the breaking of dormancy were started to find out if seed of old established varieties, such as *Up-to-Date*, from locally produced autumn crops could be used.

Reports on the ability of gibberellin to break dormancy were encouraging (DOORENBOS, 1958; TSUKAMOTO, 1958; TSUKAMOTO, ASAHIRA and NAMIKI, 1961; TSUKAMOTO, KAKO and NAMIKI, 1960; LIPPERT, RAPPAPORT and TIMM, 1958a; MATKUR, 1961). In 1958, when the present work was begun, very high concentrations of gibberellic acid (GA) were being used and tubers soaked in the solutions for hours or even days (LIPPERT, RAPPAPORT and TIMM, 1958b; RAPPAPORT, 1956). Such concentrations, even if effective, were very expensive and could not have been used in practice. Other effects of high concentrations were abnormalities in growth and development of both plant and tubers. GA had been tried mainly for breaking the dormancy of spring-grown seed required for autumn planting. The object of the present investigation was the breaking of dormancy of autumn-grown seed for spring planting. The main difference between these two requirements is one of storage temperature. Whereas the spring crop, harvested in June, is stored at dangerously high temperatures (LITTAUER, 1944), the autumn crop, harvested in December, is stored at cool temperatures during the Israel winter. As high temperatures hasten sprouting, breaking the dormancy of spring-grown seed for autumn planting presents no problem in Israel.

Another important difference is the soil temperature at the two planting seasons. The autumn crop is planted in mid-August, when soil temperatures at planting depth reach 31.8°C, whereas the spring crop is planted in mid-February, in wet cool soil with a temperature of 11–12°C (ASHBEL, 1950). Soil temperature has a major influence on the rate of emergence, which is why this character was chosen instead of the sprouting of tubers for assessing treatments. Experiments were carried out during four successive

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2. TREATMENTS AND RESULTS

2.1. First season (1958)

One hundred tubers of 150 g weight were cut in half along the long axis: 100 pieces were dipped for one minute in 50 ppm GA solution and the remainder used as a control; both were stored for a fortnight before planting. On the day of planting, a second batch of 100 tubers from the same source and of the same weight were cut and treated in the same way. In addition, 200 whole tubers of 75 g weight were divided into two equal groups, one of which was dipped in GA solution and the other kept as control. Altogether, 600 units were planted on 1 March. The rate of emergence was recorded twice weekly.

Cutting of the tubers, without further treatment, greatly influenced the breaking of dormancy (Fig. 1). Tubers cut a fortnight before planting emerged more quickly and more uniformly than tubers cut on the day of planting. Their emergence was as quick and uniform as that of whole tubers dipped in GA. The effect of GA treatment was most evident in tubers cut a fortnight before planting. After emergence, the plants had a yellow to light green colour, the stems were elongated, thin and weak, the stolons were elongated and appeared on the surface a short time after emergence. Tubers were abnormally elongated.

It was concluded that:

a. In order to obtain a quick and uniform emergence, potato tubers should be cut at least a fortnight before planting.

b. Dipping in GA solution was very effective but much lower concentrations should be tried in order to minimize growth abnormalities.

c. The synergistic action of cutting and dipping in GA solution seems to be a promising method of breaking the dormancy of autumn-grown seed required for spring planting.

2.2. Second season (1959)

During this season the influence of GA concentration was studied. Two hundred and fifty 150 g tubers were cut in half and divided into 5 groups of 100 seed pieces. The treatments consisted of dipping for 1 minute in 0, 5, 10, 20 and 40 ppm GA solutions. The tubers were cut and dipped on 10 February and planted on 24 February in randomized blocks with 4 replications, each plot containing 25 plants.

In addition to the major experiment, two minor experiments were carried out:

a. An additional 100 seed pieces were soaked for 15 minutes in 5 ppm GA in order to see whether longer contact with the solution might be more effective than the 1 minute dip used in the major experiment.