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# The effect of tuber seed cutting, tuber seed storage temperature and nitrogen fertilization in potato production

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## SUMMARY

In the present work, two treatments of the seed tuber, seed cutting and seed storage temperature were studied, with four levels of nitrogen applied once, at planting time. The cut seed gave a better yield in the medium size tubers, 37.8 T/ha and the non-refrigerated seed give a slight increased yield in this class. The response to nitrogen was better, with 150 kg/ha giving the higher total yield and the higher yields of the two largest tuber classes considered.

The effect of cutting the seed tuber must be studied again, as in the present experiment, the total and the commercial yield was higher with cut than with whole seed. With cut seed it is possible to have a large reduction on the production cost of the potato crop, as we reduce the cost of the seed tuber by nearly a half; it is only necessary to take into account the cost of cutting the tuber.

## INTRODUCTION

Portugal imports large quantity of seed tubers, 71038 t average between 1980 and 1995 (INE), and this represents a large proportion of the production costs of the potato crop. The main seed tuber suppliers are Northern European countries, and the seed is stored for a few months at temperatures between 2 and 4°C, to avoid sprout growth, disease development and water losses (Burton, 1989). Normally, the seed arrives in Portugal with a strong apical dominance and the number of stems produced for each seed tuber is small. The use of seed cutting is a traditional technique to reduce the high cost of the tuber seed. This technique is used mainly by small farmers, especially on large size tubers.

The present study was undertaken to determine the effects of both seed cutting; and storage temperature, both combined with different levels of nitrogen fertilization.

## MATERIAL AND METHODS

Seed tubers of the variety Désirée, Elite class, produced in the Azores Islands were used. A sample of tubers was measured just before planting to evaluate their main characteristics (Table 1). The field plots were established at Bragança, Quinta de S. Apolónia, the experimental farm of the ESAB, on 16 May 1998, in rows 0.65 m apart and the distance between plants was 0.35 m; the soil had a medium texture, 17.5 g kg<sup>-1</sup> of organic matter, a pH in water of 6.5 and 112 mg kg<sup>-1</sup> of P<sub>2</sub>O<sub>5</sub> (high) and 541 mg kg<sup>-1</sup> of K<sub>2</sub>O (very high).

Table 1 - Characteristics of the seed tubers used in the experiment

Storage	Cold <sup>1</sup>	Warm <sup>2</sup>
tuber weight (g)	74.6	86.7
total number of eyes (#)	9.1	9.4
opened eyes (#)	7.0	7.9
eyes with sprouts (#)	0.0	1.0
longest sprout (cm)	1.0	2.9
apical sprouts (#)	0.0	0.7

1-4 to 6°C; 2 -room temperature, near 14°C

The experimental design used was a factorial combination of seed cut, seed temperature and nitrogen fertilization, applied at planting time, with four levels of nitrogen: 0, 75, 150 and 300 kg/ha, arranged in 3 blocks. During the growing period, the crop was irrigated with a sprinkler system, and protected against late blight and Colorado beetle. At harvesting, the tubers were divided into 3 size classes: small, (<30), medium (30-65) and big (>65 mm).

## RESULTS AND DISCUSSION

The results presented here are preliminary and respect only to the main effects on potato yield of the three factors in study: seed cutting, storage temperature and nitrogen.

The cutting of the seed (Table 2) had a significant effect on each size class and on total yield. The data shows a positive effect for the two smaller size classes and for total potato yield, and a negative effect for the largest size class considered.

Table 2 – Effect of cutting the seed on final tuber yield (t/ha)

seed cutting	(<30)	(30-65)	(>65)	Total
yes	3.6a	37.8a	3.0a	44.4a
no	2.2b	34.1b	5.3b	41.6b

Fisher's LSD test at 5%

The cutting of the seed tubers can result in yield losses due to several reasons (i) degree of subdivision of the cut tuber, which can reduce the percentage of emergence; (ii) reduced number of stems per hill (iii) greater susceptibility to desiccation of small seed pieces (iv) greater susceptibility of seed pieces to rot, due to soil born diseases, which is worse, if it is raining at planting time (Burton, 1989). In the present study the tubers were only cut longitudinally in half, the two half kept together to avoid desiccation, they were planted a few days after cutting; the cut seed gave a slight increase in all the yield classes considered.

The storage conditions (Table 3) had a significant influence on the two larger size classes considered and on total production, showing that there was no need for special refrigeration during the storage period. The storage temperature of seed tubers has influence on the physiological age of the tuber and its sprouting behaviour. If the potato tuber is stored immediately after harvesting under conditions favourable to sprout growth, the apical bud grows first and it suppress the growth of the other buds.

If the tuber is stored at a moderately low temperature (below 5°C), all the buds growth,

there being no apical dominance. Variation in the storage temperature allows the number of stems per hill, the number of tubers in the crop and their size to vary (Burton, 1989). In the present case, the refrigerated seed tuber were planted physiologically too young, giving a fewer stems and a lower yield.

Table 3 – Effect of storage temperature in final yield (t/ha)

refrigeration	(<30)	(30-65)	(>65)	Total
yes	2.9a	35.5a	3.2a	41.6a
no	2.9a	36.4b	5.1b	44.4b

Fisher's LSD test at 5%

The effect of nitrogen fertilization (Table 4) was significant for the larger tuber class and total yield. Nevertheless, the N effect was curvilinear, since the highest N doses showed a negative effect and presents a potato production similar to the yield obtained with a fertilization of 75 kg/ha. Similar patterns were observed for all tuber size classes.

Table 4 – Effect of nitrogen fertilisation on final yield (t/ha)

nitrogen	(<30)	(30-65)	(>65)	Total
N 0	2.8	32.3	2.7	37.8
N 75	2.8	36.8	3.8	43.4
N 150	3.1	38.8	5.8	47.7
N 300	2.9	35.8	4.4	43.1

Combining all the factors and in the conditions of the present study, it may be concluded that the highest potato yield was obtained with a nitrogen fertilization of 150 kg/ha, after the tubers had been cut at planting time, with there being no need of special refrigeration during the storage period.

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