

SELECTION OF YOUNG POTATO SEEDLINGS FOR EARLINESS¹

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Summary – Zusammenfassung, Résumé, Resumen, p. 184

1. INTRODUCTION

Breeding for early maturity in potato varieties is important in Spain (ODRIOZOLA, 1955; ZUBELDIA, 1961 a, b).

Breeding for earliness is carried out at the “Estación de Mejora de la Patata” (Station for Potato Breeding) at Vitoria (Spain). It was realized when this work started, that some method of distinguishing the unwanted late-maturing seedlings at an early stage of growth would be helpful.

During the period 1956–1958, the following correlations were found (ZUBELDIA, 1960): *seedlings showing erect upper leaves (closed top) gave rise to late forms, those with spreading upper leaves (open top) usually gave early forms* (FIG. 1).

Seedlings with closed tops are discarded in the glasshouse. Such types may be distinguished approximately two months after sowing the seed (normally sown about the middle of March), and about one month after transplanting the seedlings into small pots (only this transplantation is done). The actual selection is carried out in June, when the seedlings are well developed and the shape of the top is best seen.

In addition to the above method of detecting late maturing types, the correlation reported by STEINECK (1958) has also proved useful. It permits the elimination of seedlings with short-day requirements (that would become late forms), because their stolons grow horizontally and then upwards during longer photoperiods.

By applying STEINECK's criterion, we discard not only all seedlings with closed tops, but also those with semi-open tops which have stolons growing upwards (FIG. 4). This enables us to discard a higher proportion of late maturing types at an early stage of growth.

Selected seedlings were allowed to complete their growth in the glasshouse, and when mature, one tuber per seedling was kept for planting in the field the following year.

During the period 1960–1962, both STEINECK's and ZUBELDIA's criteria were employed. ZUBELDIA's criterion probably permits of an earlier diagnosis; for example, some seedlings showing semi-open tops in June did not develop the upward growing stolons until July.

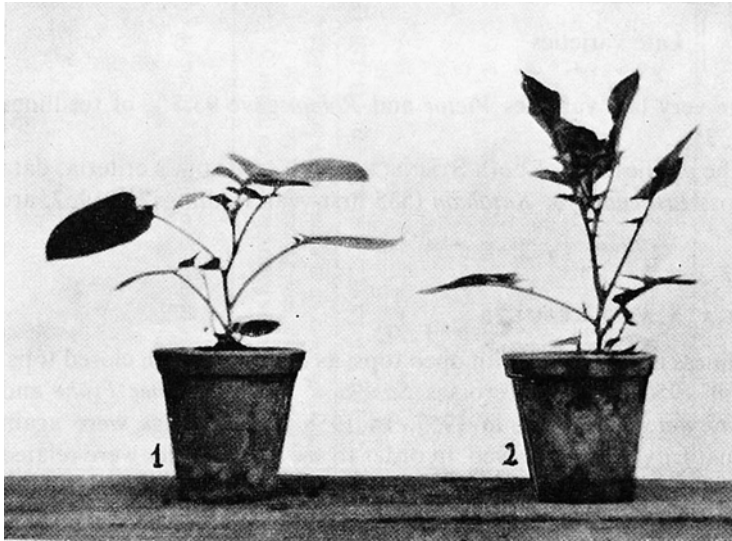
By using both criteria it was observed that the proportion of seedlings with open tops and showing stolons growing upwards was practically negligible (FIG. 4).

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FIG. 1. First-year seedlings of the cross *Saskia* × *Oberarnbacher Frühe*



1. Open top – *offener Wipfel* – *sommet ouvert*.
 2. Closed top – *geschlossener Wipfel* – *sommet fermé*.
- of pot – *der Töpfe* / *du pot*: 10 cm.

ABB. 1. Einjährige Sämlinge der Kreuzung *Saskia* × *Oberarnbacher Frühe*

FIG. 1. *Plantules de première année du croisement Saskia* × *Oberarnbacher Frühe*

An interesting criterion has been reported by ENGEL and MÖLLER (1959). They found that 80% of seedlings showing long stolons when ready to transplant from boxes to pots (second transplantation) had either early or medium-early maturity. They used this method of detecting earlies in crosses of early × late forms, which were expected to give a high proportion of lates.

Maturity of first-year seedlings in the glasshouse was found to be correlated with maturity as subsequently observed in the field (KRANTZ, 1938; MÖLLER, 1956), no criteria for the early diagnosis of maturity were, however, given.

2. MATERIAL AND METHODS

In 1956, first-year seedlings belonging to two crosses were observed – 150 seedlings of *Saskia* × *Oberarnbacher Frühe* (early varieties) and 158 seedlings of *Ackersegen* × *Merkur* (late varieties) – in order to determine the differences between the two progenies during the long days of the year and to record any sharp morphological difference occurring between late and early seedlings. These experiments led to an appreciation of a relationship between closed tops and late seedlings (FIG. 2, TABLE).

In 1958, again four crosses were investigated (256 first-year seedlings each):

Saskia × *Oberarnbacher Frühe*
Allerfrüheste Gelbe × *Oberarnbacher Frühe* } Early varieties
Ackersegen × *Merkur* } Late varieties
Victor × *Robijn* }

The cross between the very late varieties *Victor* and *Robijn* gave 95.5% of seedlings with closed tops (FIG. 3).

As an example of the application of both STEINECK's and ZUBELDIA's criteria, data obtained from the cross *Erntedank* × *Katahdin* (535 first-year seedlings) in 1962, are given in FIG. 4.

3. EXPERIMENTAL DATA AND RESULTS

FIG. 2 shows that earliness is correlated with open tops, as lateness is with closed tops. First-year seedlings in 1956, from the crosses *Saskia* × *Oberarnbacher Frühe* and *Ackersegen* × *Merkur*, were multiplied in 1957. In 1958 the seedlings were again multiplied and their maturity dates observed, in order to see if maturities were related to the type of top.

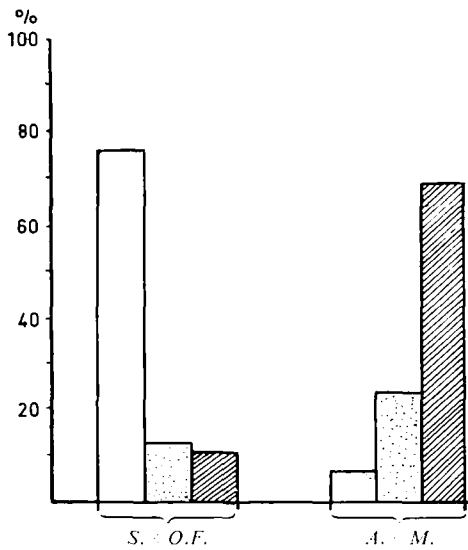


FIG. 2
Percentages of seedlings according to type of top (observation date 13.6.56)

ABB. 2
Prozent Sämlinge entsprechend der Wipfelart (Beobachtungsdatum 13.6.56)

FIG. 2
Pourcentages de plantules de chacun des types de sommet (date d'observation 13-6-56)

S. × O.F. *Saskia* × *Oberarnbacher Frühe* (cross of early varieties – *Kreuzung aus frühen Sorten – croisement de variétés précoces*),
 A. × M. *Ackersegen* × *Merkur* (cross of late varieties – *Kreuzung aus späten Sorten – croisement de variétés tardives*).

- open tops – *offene Wipfel* – *sommets ouverts*.
- semi-open tops – *halboffene Wipfel* – *sommets mi-ouverts*.
- closed tops – *geschlossene Wipfel* – *sommets fermés*.

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TABLE. Third-year seedlings; classification of the seedlings according to the number of days from planting to maturity (date of planting 26.5.58)

Cross Kreuzung Croisement	Type of top in 1956 Wipfelart in 1956 Type de sommet en 1956	Number of seedlings Anzahl Sämlinge Nombre de plantules	Number of days from planting to maturity Anzahl Tage vom Pflanzen bis zur Reife Nombre de jours de la plantation à la maturité						
			A	B	C	D	E	F	G
Saskia Fröhe	Open ¹	66	10	19	27	8	1	-	1
	Semi-open ²	13	1	5	3	2	2	-	-
	Closed ³	12	-	1	4	2	3	2	2
	total	91	11	19	33	15	5	5	3
Ackersenegen Merkur	Open ¹	10	-	-	5	2	3	-	-
	Semi-open ²	32	-	1	4	17	7	3	3
	Closed ³	74	-	-	2	13	25	34	34
	total	116	-	-	1	11	32	35	37

¹ offen - ouvert. ² halboffen - mi-ouvert. ³ geschlossen - fermé.

TABELLE. Dreijährige Sämlinge; Einstufung der Sämlinge entsprechend der Anzahl Tage vom Auspflanzen bis zur Reife (Pflanzdatum 26.5.58)
TABLEAU. Plantules de 3e année; classification des plantules selon le nombre de jours de la plantation à la maturité (date de plantation 26-5-58)

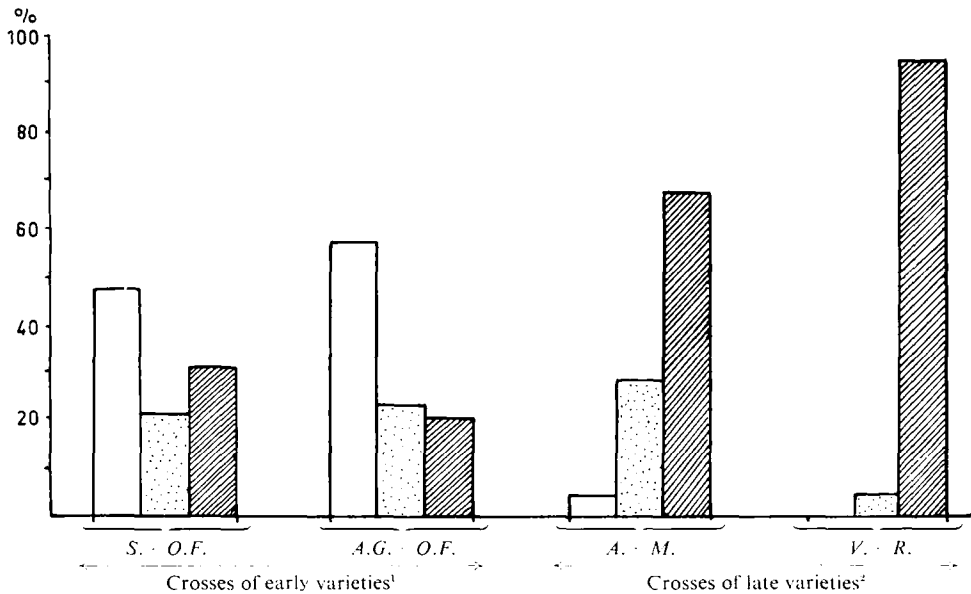
The results are shown in the TABLE. It is interesting that seedlings with closed tops are not found in the earlier groups A and B, and only one of them is found in group C.

The number of seedlings was reduced from 1956 to 1958, as elimination due to weakness and virus infection took place.

In FIG. 3 as in FIG. 2, earliness is correlated with open tops, and lateness with closed tops. The cross between the very late varieties *Victor* and *Robijn* did not give any seedling with open tops, those with closed tops amounted to 95.5%.

FIG. 4 shows that the proportion of seedlings with open tops together with stolons growing upwards is very small (there were only two seedlings of this kind, and their upward growing stolons were few and thin).

FIG. 3. Percentages of seedlings according to type of top (observation date 18.6.58)



S. · O.F. · · · · · *Saskia* · *Oberarnbacher Frühe*.

A.G. · O.F. · · · · · *Allerfrüheste Gelbe* · *Oberarnbacher Frühe*.

A. · M. · · · · · *Ackersegen* · *Merkur*.

V. · R. · · · · · *Victor* · *Robijn*.

¹ Kreuzungen aus frühen Sorten – croisements de variétés précoces.

² Kreuzungen aus späten Sorten – croisements de variétés tardives.

□ open tops – offene Wipfel – sommets ouverts.

▒ semi-open tops – halboffene Wipfel – sommets mi-ouverts.

▨ closed tops – geschlossene Wipfel – sommets fermés.

ABB. 3. Prozent Sämlinge entsprechend der Wipfelart (Beobachtungsdatum 18.6.58)

FIG. 3. Pourcentages de plantules de chacun des types de sommet (date d'observation 18-6-58)

SELECTION OF YOUNG POTATO SEEDLINGS FOR EARLINESS

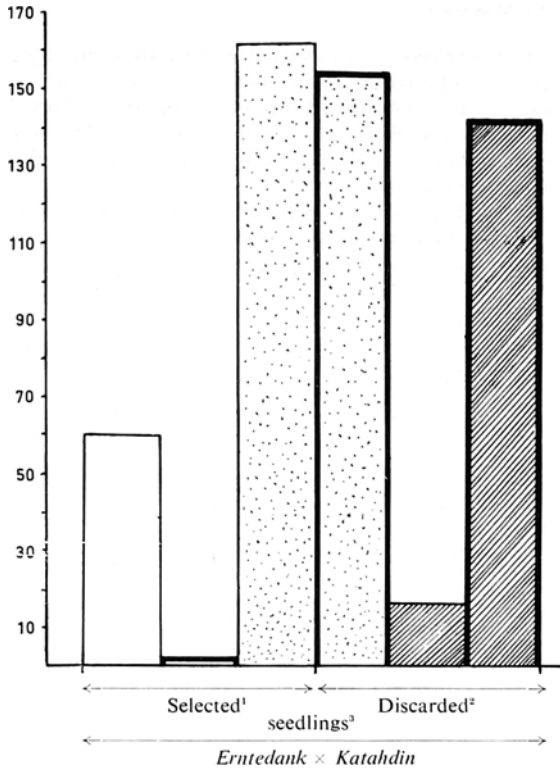


FIG. 4
Numbers of seedlings according to type of top and type of stolon (observation date 14.6.62)

ABB. 4
Anzahl Sämlinge entsprechend der Wipfel- und der Stolonenart (Beobachtungsdatum 14.6.62)

FIG. 4
Nombre de plantules de chacun des types de sommet et de stolon (date d'observation 14-6-62)

¹ *ausgesessene - séléctées.*
² *verworfenne - éliminées.*
³ *Sämlinge - plantules.*

	without stolons growing upwards - <i>ohne aufwärts wachsende Stolonen - sans stolons poussant vers le haut.</i>	} open tops <i>offene Wipfel - sommets ouverts</i>
	with stolons growing upwards - <i>mit aufwärts wachsenden Stolonen - avec stolons poussant vers le haut.</i>	
	without stolons growing upwards	} semi-open tops - <i>halboffene Wipfel - sommets mi-ouverts.</i>
	with	
	without	} closed tops - <i>geschlossene Wipfel - sommets fermés.</i>
	with	

4. CONCLUSIONS

Data given in the figures and table show the value of the closed or open top as a criterion in distinguishing late potato seedlings from early ones.

This criterion probably offers an earlier diagnosis than that of STEINECK. STEINECK's criterion has also been used from 1960 onwards, and has been very useful in complementing the criterion described in the present paper.

SUMMARY

In the "Estación de Mejora de la Patata" (Station for Potato Breeding) at Vitoria (Spain), a criterion has been found which enables late types of potato seedlings to be discarded at an early stage of growth. This criterion has been used during the period 1959–1962 in the breeding of early varieties, and has proved very useful. Seedlings with closed tops are eliminated, because they become late forms. Those with open tops, generally mature early.

Selection is carried out in the glasshouse. Closed tops begin to become apparent approximately two months after sowing true seed (normally sown about the middle of March), when seedlings have been growing for about one month in small pots.

The actual discarding is usually done in June, when the seedlings are well developed and the shape of tops can be readily distinguished.

ZUSAMMENFASSUNG

AUSLESE JUNGER KARTOFFELSÄMLINGE AUF FRÜHREIFE

Das Institut für Kartoffelzüchtung in Vitoria (Spanien) hat ein Kriterium erarbeitet, das das Verwerfen spätreifender Typen von Kartoffelsämlingen in einem frühen Wachstumsstadium ermöglicht. Die Methode wurde von 1959–1962 bei der Züchtung von frühen Sorten angewandt und als sehr nützlich befunden.

Sämlinge mit geschlossenem Wipfel (d.h. oberste Blätter aufwärts gerichtet) werden ausgeschieden, weil sie zu spätreifenden Formen heranwachsen; jene mit offenem Wipfel reifen im allgemeinen früh (ABB. 1, 2 und 3; TABELLE).

Die Auslese wird im Glashaus vorgenommen. Geschlossene Wipfel sind ungefähr zwei Monate nach der Aussaat der Samen (Saatzeit normalerweise um Mitte März) zu erkennen, d.h. ungefähr einen Monat nachdem die Sämlinge in kleine Töpfe pikiert worden sind.

Die Auslese der Sämlinge wird jedoch gewöhn-

lich im Juni vorgenommen, wenn die Pflänzchen gut entwickelt sind und die Form des Wipfels klar unterschieden werden kann.

Neben der obenerwähnten Methode, spätreifende Sortentypen zu entdecken, hat sich die von STEINECK (1958) beschriebene Korrelation als nützlich erwiesen. Sie gestattet die Ausscheidung von Sämlingen mit Kurztag-Ansprüchen (spät-reifende Typen), weil ihre Stolonen horizontal und dann bei längerer Belichtung aufwärts wachsen.

Bei Anwendung von STEINECK's Kriterium verwerfen wir nicht nur alle Sämlinge mit geschlossenem Wipfel, sondern auch jene mit halboffenem Wipfel, deren Stolonen aufwärts wachsen (ABB. 4). Dies ermöglicht die Ausscheidung eines grösseren Anteils von spätreifenden Typen in einem frühen Wachstumsstadium.

RÉSUMÉ

SÉLECTION DE JEUNES PLANTULES DE POMME DE TERRE POUR LA PRÉCOCITÉ

A la Station d'Amélioration de la Pomme de terre à Vitoria (Espagne) un critère a été trouvé qui permet d'éliminer les types tardifs à un stade précoce de développement. Ce critère a été utilisé durant la période 1959–1962 dans l'obtention de variétés précoces et s'est révélé être pleinement utile.

Les plantules avec un sommet fermé étaient éliminées parce qu'elles devenaient des types tardifs;

les plantules avec un sommet ouvert mûrissaient généralement tôt (FIG. 1, 2 et 3, TABLEAU).

La sélection est effectuée en serre. Les types fermés commencent à se manifester environ deux mois après le semis (qui se fait normalement à la mi-mars) alors que les plantules ont végété environ un mois en petits pots.

La véritable élimination a lieu habituellement en juin; à ce moment les plantules sont bien déve-

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luppées et la forme des sommets se distingue nettement.

Complètement à la méthode ci-dessus décrite de détection de types de maturité tardive, l'application de la corrélation de STEINECK (1958) s'est également révélée pleine d'utilité. Elle permet l'élimination de plantules ayant des exigences de jours courts (qui deviendraient des formes tardives), qui sont celles dont les stolons poussent horizontalement et ensuite vers le haut

durant les photopériodes plus longues.

En appliquant le critère de STEINECK, nous écartons non seulement toutes les plantules avec sommet fermé, mais aussi celles avec le sommet mi-ouvert qui ont des stolons se développant vers le haut (Fig. 4). Cette façon de faire nous permet d'éliminer une proportion plus élevée de types de maturité tardive à un stade précoce de développement.

RESUMEN

SELECCIÓN PARA PRECOCIDAD EN PLÁNTULAS DE PATATA

En la "Estación de Mejora de la Patata" de Vitoria (España), se descubrió un criterio para eliminar tipos tardíos en plántulas de patata. Dicho criterio se ha venido aplicando durante el período 1959-1962, mostrándose muy útil en el proceso de obtención de nuevas variedades tempranas (o de ciclo corto).

Las plántulas que presentan su ápice erecto deben eliminarse, porque darían lugar a clones tardíos; las de ápice péndulo responden normalmente a clones tempranos (Figs. 1, 2 y 3; Tabla). Las eliminaciones tienen lugar en invernadero. Los ápices erectos empiezan a expresarse hacia los dos meses de sembradas las semillas (la siembra tiene lugar hacia mediados de Marzo), cuando las plántulas llevan aproximadamente un mes desarrollándose en macetitas (se efectúa trasplante único de semillero a macetitas).

Habitualmente las eliminaciones se realizan en Junio, ya que entonces las plántulas se encuentran bien desarrolladas y muestran mejor la forma de sus ápices.

De 1960 a 1962, el criterio descrito se ha venido complementando con el enunciado por STEINECK (1958), que permite la eliminación de las plántulas con adaptación al día corto (las cuales resultarían en clones tardíos), debido a que sus estolones crecen primero horizontalmente y después hacia arriba, durante los días más largos del año. Aplicando este último criterio, se eliminan no solamente las plántulas de ápice erecto, sino también aquellas de ápice intermedio entre erecto y péndulo, que presenten el crecimiento de estolones indicado (Fig. 4), incrementando la proporción de plántulas eliminadas, y aumentando, por tanto, la eficacia de la selección.

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