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REPORT ON THE MEETING OF THE SECTION VARIETIES OF THE EUROPEAN ASSOCIATION FOR POTATO RESEARCH HELD AT CAMBRIDGE ENGLAND, SEPTEMBER 23rd-27th 1962

C. Lugt and G. Goodijk

CONTENTS

INTRODUCTION

The working group "Potato Quality Research" was formed during an international meeting of experts in this field at Düren, Germany in 1956, for which Dr. Siebeneick took the initiative.

At the second meeting of the working group at Wageningen in 1958 the members decided to join the European Association for Potato Research, Section Utilization.

A third meeting was held at Zurich, Switzerland in 1959.

The next meeting was in 1960 at the Triennial Conference of the E.A.P.R. in the Section Utilization. At this Conference it appeared that the members of the working group were more interested in the subjects of the Section Varieties than in those of the Section Utilization, as nearly all of them were working on variety research.

For this reason the working group changed section and joined the Section Varieties. The members of this Section decided to organize a separate meeting at Cambridge, England in 1962. Mr. J.C. Cullen from the National Institute of Agricultural Botany (N.I.A.B.), Cambridge, was asked to organize this meeting.

The meeting was held at the N.I.A.B. After opening of the conference by Mr. J.A. Hogen Esch, chairman of the section, Mr. Horne, director of the N.I.A.B., gave a short survey of the task and organisation of the institute.

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HUGHES, J.C.	Research Assistant
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HARRISON, Miss, A.	Scientific Assistant

PROGRAMME

SUNDAY, September 23rd

Conference assembles.

MONDAY, September 24th. J.A. Hogen Esch, Chairman: Opening
F.R. Horne, Director: Welcome to N.I.A.B.

Theme: Breeding, Resistance to Disease, and Other Aspects of Performance.

Howard, H.W.	Assessment of disease resistance - The breeders problems
Thompson, N.R.	Increasing gene frequency for immunity to potato virus X by inbreeding
Todd, J.M.	Assessing the selective susceptibility of varieties to tuberdiseases, particularly gangrene and skinspot
Richardson, D.E.	Methods of assessing reactions to aphistransmitted viruses
Kostrowicka, Miss M:	Demonstrations - Methods of assessing reactions to Phytophthora in foliage and tubers
Kawakami, K.	The influence of age of seedtubers on the subsequent growth and yield
Zubeldia, A.	Selection of young potato seedlings for earliness
Cullen, J.C.	The interpretation of results of field trials with potatoes in England and Wales

TUESDAY, September 25th

Theme: Quality

Lugt, C.	A mathematical view of the European method of quality assessment of potato-varieties
Höppner, Mrs. E.	Zur Einteilung von Kartoffeln nach Speisekartoffeltypen
Harries, J.M.	Objective assessment of the texture of cooked potatoes
Swiezyński, K.M.	Selection of parental forms in breeding potatoes with high starchcontent
Hughes, J.C.	Biochemistry of after-cooking discolouration in relation to variety and growing conditions
Cullen, J.C.	The application of the European method of quality assessment to British varieties

WEDNESDAY, September 26th

Morning : 1. Any unfinished business
2. Inspection of field trials, potato store and demonstrations

Afternoon: Conducted tour of Cambridge Colleges

THURSDAY, September 27th

Excursion to packing station, commercial farms and Experimental Husbandry Farm.

SUMMARIES OF PRESENTED PAPERS AND DISCUSSIONS

ASSESSMENT OF DISEASE RESISTANCE - THE BREEDERS' PROBLEMS

H.W. Howard

Plant Breeding Institute, Cambridge

To the potato breeder there are at least three distinct aspects of the assessment of disease resistance - the importance of the disease, the level of resistance at which to aim, and the methods of testing which can be used.

There is no point in breeding for resistance to any disease or pest, which is of little importance or which can be controlled by chemical means or cultural practises, because there are several important diseases which are best controlled by the use of resistant varieties. It might appear that the breeder should aim at as high a level of resistance as possible, but a study of standard varieties suggests that for certain diseases not too susceptible, rather than highly resistance, would be adequate. In considering methods of testing for disease resistance, the smaller the number of plants which must be used, the better it is for the breeder, because he can then test material early in his programme.

It must be emphasised that in any crop there are few, if any, perfect varieties and that any variety is a balance of merits and faults. Thus the standard, widely grown potato varieties are all susceptible to one or more diseases, but it is still possible to grow them successfully. It must also be remembered that there is a long list of diseases which can attack potatoes and it is therefore unlikely that any new variety will be resistant to all diseases.

The above points were discussed with reference to wart (Synchytrium endobioticum), blight (Phytophthora infestans), common scab (Streptomyces scabies), powdery scab (Spongospora subterranea), dry rot (Fusarium caeruleum), viruses X, S, A, Y and leaf roll, and root eelworm (Heterodera rostochiensis).

DISCUSSION

Keller : What varieties in England are resistant to powdery scab?

Howard : In our experience, King Edward VII and the new variety Maris Peer have shown a very high resistance

Hogen Esch: Is testing for wart carried out in the laboratory or in the field?

Howard : In Scotland and in England a laboratory test is used and in Northern Ireland a field test. The laboratory test appears to be more severe than the field test

Kloosterman : Is there any influence of the temperature during storage on skin spot? Nowadays potatoes are stored at a lower temperature than in former times. Is it possible that there is more skin spot at these lower

INCREASING GENE FREQUENCY FOR IMMUNITY TO POTATO VIRUS X
IN TETRAPLOID SOLANUM TUBEROSUM L. THROUGH INBREEDING

temperatures?

Todd : Low temperatures are important indeed. We know that a lot of water in the soil and a cool autumn gives a lot of skin spot

Roguski : Concerning symptoms on stems, have you seen any lesions by Phoma on growing plants?

Todd : There can be a prolific development of lesions by Phoma on dead stems, on stems of a growing plant I do not know

Münster : We have special difficulties with gangrene when transporting potatoes after mechanical grading. Potatoes are normally transported after grading. It is better when the potatoes are graded and stored at the same place

Kostrowicka: Is bruising wounding also important?

Todd : I do not know the influence of bruising as such on the development of gangrene, but gangrene often develops after grading and transporting

Höppner : We also have the experience that transport has an important influence on the development of gangrene

METHODS OF ASSESSING REACTIONS TO APHID-TRANSMITTED VIRUSES

D.E. Richardson

National Institute of Agricultural Botany, Cambridge

Field Tests

Assessment of varietal resistance to leaf roll and virus Y is largely based on natural infections occurring in stocks grown for one or two years at a number of regional trials centres. These are selected to give varying amounts of infection under a range of environmental conditions. An example of the range of percentage infections obtained in one year, 1960, is given in **table 1.**

We would generally regard Majestic as being moderately susceptible to both leaf roll and virus Y. Most of the named varieties over the past 10 years have fallen into a similar category, with some being considerably more susceptible. Ulster Tarn has been outstandingly resistant to both leaf roll and virus Y; over a 4 year period there has been an average of about 70% less virus than in Majestic grown under similar circumstances. A more recent variety, Pentland Crown, is probably similar. Ulster Supreme has been highly resistant to virus Y only; this resistance is of the hypersensitive type, which has sometimes broken down in recent years in this variety.

Table I

Centre	Arran Viking		Majestic		Ulster Beacon		Ulster Supreme		Ulster Tarn		Ulster Torch	
	LR	Y	LR	Y	LR	Y	LR	Y	LR	Y	LR	Y
Cambridge	29	78	27	73	13	85	17	2	4	14	35	5
Cockle Park	7	6	0	4	0	0	6	1	0	0	2	8
Harper Adams	40	18	15	9	21	15	34	0	1	1	21	2
Headley Hall	0	0	10	0	12	2	5	0	2	2	4	2
Kent	10	87	3	69	5	90	25	6	2	5	12	17
Lindsey	24	30	30	6	29	15	8	0	0	3	15	2
Seale-Hayne	2	0	4	1	2	0	6	0	0	0	0	0
Sutton Bonington	55	60	55	67	36	95	50	39	0	7	15	14
Terrington	52	0	50	4	65	4	65	0	30	0	37	1
Winmarleigh	4	6	0	1	10	0	20	0	0	0	12	0
Average %	22	28	19	23	19	31	24	5	4	3	15	5

Glasshouse Tests

An attempt has also been made to work out a satisfactory test for use in an aphid-proofed glasshouse, which would enable a new variety to be tested early in its development, and would give some measure of control over the aphids. The placing of equal numbers of viruliferous aphids on each variety has been compared with free aphid movement between virus infected plants and varieties arranged in latin squares in small cubicles. The latter method has given satisfactory results for leaf roll, but both methods sometimes gave results for virus Y which differed from those obtained in the field, especially with varieties which are hypersensitive to virus Y.

One of the difficulties of the free aphid method for virus Y seems to be due to the behaviour of aphids in flying from the infectors to the roof and sides of the cubicle before settling on the test plants; this often results in low infection rates, and when infections occur they do so unevenly around the sides of the cubicle.

Although glasshouse tests might give useful indications of how a new variety would react, they were not reliable enough to use as a substitute for field tests.

Resistance to Aphids

The preferences of aphids for certain varieties has also been demonstrated. The most notable variety was Ulster Tarn, which clearly was not such a favourable host plant as other varieties.

Variety/Aphid Relations

Average of 4 tests; counts taken after 10 days exposure to colonisation

	Majestic	Ulster Supreme	Ulster Torch	Ulster Beacon	Ulster Tarn
Total No. Aphids	639	838	787	606	259
% Colonised Plants	81	84	80	74	66
No. Aphids per Plant	19	25	23	18	8

How far this is the cause of the resistance of Ulster Tarn to virus infection we do not know, but it must surely be a contributory cause of it escaping infection - at least leaf roll. If Ulster Tarn does become heavily infected in the field, it is usually with virus Y, the infection taking place before any repellant action takes effect. Other varieties may have comparatively high aphid counts and low infection rates (e.g. Pentland Beauty), indicating genetical resistance to virus infection, independent of aphid preferences.

DISCUSSION

Gabriel :Is there an interaction between locality and variety in relation to these virus diseases?

Richardson:Differences may be due to locality and to strain of virus. It is more likely to be the strains of virus than the locality

Gabriel :Ackersegen is in Poland very susceptible to virus Y, but we found few aphids on this variety

Todd :This can be a question of an other strain of virus

METHODS OF ASSESSING REACTIONS TO PHYTOPHTHORA INFESTANS IN FOLIAGE AND TUBERS

M. Kostrowicka

National Institute of Agricultural Botany, Cambridge

Work carried out at N.I.A.B. on potato blight has two aspects:

1. Testing varieties for resistance in foliage and tubers
2. Identification of the races occurring in this country

Resistance tests of 2 types:

A. True Resistance based on presence or absence of the major resistance genes, and is assessed by hypersensitivity reactions. Identification of races is carried out on the same principles.

1. Detached leaves are used in both cases. Leaves are placed in a moist culture dish, zoospore suspension dropped on each leaflet by means of a pipette, the dish covered with a glass sheet, and incubated at room temperature for 4-6 days.
2. Longitudinally cut tubers, previously surface-sterilised in 0.5% mercuric chloride if affected by Rhizoctonia, are placed cut surface up in a culture dish and inoculated either by dropping zoospore suspension or by means of filter paper discs soaked in the suspension and placed on the cut surface after removing the excess of moisture. Dishes covered with glass-sheets are kept at room temperature for 7 days. The assessment is made according to the type of the necrosis, the depth of penetration, and mycelial growth.

B. Field Resistance

1. Foliage:- Method of foliage testing has been developed at N.I.A.B. by K.O. Müller, and is roughly as follows - Leaves of the varieties to be tested are collected from the field. Circular discs are cut from them by means of a corkborer (1 cm diam.), placed in randomized way in moist culture dishes, and sprayed with rather weak suspension of the zoospores. The dishes then are covered with glass-sheets and incubated for 5-7 days at room temperature. It is important to collect leaves at the earliest possible stage of growth before other organisms colonize the plants.
2. Tubers:-
   a. Field tests in 1960 and 1961 for assessing field resistance to blight in tubers included 8 maincrop varieties - 2 R1 genotypes and 6 recessive ones. (Orion & Ulster Torch; Arran Viking, Ulster Beacon, Ulster Supreme, Ulster Tarn, Majestic and King Edward.) All varieties were set up in microplots of 4 plants surrounded by single rows of Majestic and King Edward which were also included in the microplot scheme with 12 replications.

      At the beginning of July blight was introduced to Majestic plants next to each plant of the microplot thus creating the same infection chance for each of the 4 plants. Blight was introduced by means of gauze strips soaked in zoospore suspension and supplied to the wounded stems.

      Tubers were lifted shortly after the plants died down, and healthy and diseased ones were counted in each microplot. Healthy looking tubers were stored and after 10-12 weeks examined. Diseased tubers were counted again giving the final amount of infected tubers for each microplot and the variety tested.
   b. Glasshouse tests were performed with the same 8 varieties. Tubers from the pots were inoculated by spraying zoospore suspension on them at two stages of development - immature and at full maturity. After inoculation tubers, still attached to the stolons if possible, were placed in moist biscuit tins, covered with black polythene sheet and stored for

4-6 weeks, and then examined and the diseased ones counted.[x)]

Tuber test results for 1960 and 1961 were as follows:

Varieties	Average % blighted tubers 1960-61	
	Field	Glasshouse (mature tubers)
Orion	0.0	1.2
Majestic	1.9	3.6
Arran Viking	3.7	3.0
Ulster Beacon	8.1	3.9
Ulster Supreme	12.1	6.3
King Edward	13.1	6.9
Ulster Tarn	14.5	10.2
Ulster Torch	20.7	15.2

DISCUSSION

Howard :How was the blight inoculated to tubers in the glasshouse?

Kostrowicka:After cutting the tops of the plants the whole root-systems were knocked out, cleaned from the exesse of the soil, placed on the covers of the biscuit-tins, and sprayed with the zoospore suspension.

In the meantime the tins (half-size biscuit-tins) were made ready, with a moist layer of cellulose wadding and filter paper at the bottom, and roots, after being sprayed were placed into them, covered, and incubated for 4-6 weeks in the store.

Howard :On which part of the tuber did most of the infection take place?

Kostrowicka:Mainly through the eyes, but it came to tubers also from the infected stolons.

x) The results for both years with mature tubers seem to place the varieties in almost the same order as in the field tests, but the results on immature tubers were not in full agreement.

THE INFLUENCE OF AGE OF SEED TUBERS ON THE SUBSEQUENT GROWTH AND YIELD

K. Kawakami

Hyogo Agricultural College, Sasayama

Summer - and fall grown seed tubers have been compared in summer crop. The fall grown seed tubers had a higher productivity than the summer grown seed, which is due to the fact that the former had been lifted in October and planted after having been stored for 6 months, which is the suitable age for seed tubers.

Full publication on this subject:
Kawakami, K.: "The physiological degeneration of potato seed tubers and its control" in the European Potato Journal, vol. 5, No. 1, p. 40-50

SELECTION OF YOUNG POTATO SEEDLINGS FOR EARLINESS

A. Zubeldia

Estación de Mejora de la Patata (I.N.I.A.), Vitoria, Spain

In the "Estación de Mejora de la Patata" (Station for Potato Breeding) at Vitoria (Spain), a criterion to discard late types in potato seedlings was detected. Such criterion has been applied during the period 1959-1962 in the breeding of new early varieties, and showed very useful.

Seedlings with erect shoot tips must be eliminated, because they would become late forms. Those with drooping tips, generally mature early.

Discarding takes place in the glass-house. Erect tips begin to become apparent approximately two months after sowing true seed (sowing about the middle of March), when seedlings have grown during about one month in small pots.

Usually discarding is done in June, then seedlings are well developed and show better the shape of their shoot tips.

Full publication on this subject will follow in the European Potato Journal in 1963.

A MATHEMATICAL VIEW OF THE EUROPEAN METHOD OF QUALITY ASSESSMENT OF POTATO-VARIETIES

C. Lugt

Institute for Biological and Chemical Research on Field Crops and Herbage, Wageningen

Method of quality assessment

In the course of a number of years, the working group on "Potato Quality Research" developed a system for quality assessment of potato varieties (table I). A description of this system is given separately.

The purport of this work was:

1. To make an exchange possible of data on quality of varieties, comprehensible to other variety experts
2. To find a simple quality description (utilization-type), derived from the various assessed characteristics, which enables a classification of potato varieties to be made according to their cooking quality

Since this system is based on agreements concerning characteristics sensorially determined it is useful to examine judgements on the same material from experts in different countries. This examination has two different aspects:

1. Interrelations between the various characteristics and their influence on the assessment of the utilization type
2. Systematical differences in the determinations of various judges

Only the former point will be discussed here.

Mathematical treatment

If in an investigation on more than one characteristic, all characteristics are of equal importance, or if it is impossible to discriminate between them, because of un-acquaintance with their nature, an analysis of a number of characteristics considered equivalent is convenient, an analysis of this kind is the multi variate analysis. In this analysis the swarm of points of the treatments (varieties), which has formed under the influence of all investigated characteristics, is considered. In case of e characteristics this swarm lies in an e demensional space, as every characteristic corresponds with one demension.

A case of 3 characteristics will be discussed, as in this case it is still possible to form a geomatrical idea. By projecting the swarm of variety points and also the axes of the characteristics on the plane of widest variation, it is possible to answer the following questions.

1. which of the characteristics indicate in general differences between varieties?
2. what varieties form groups, with regard to the investigated characteristics?
3. what characteristics are of importance in distinguishing groups of varieties or even individual varieties?

Experimental material and results

The mathematical operation, described above, is applied to the variety data obtained from the internationally exchanged samples in 59/60 add 60/61. The individual sets of data from every laboratory are considered as replications. Only the data from the 6 characteristics, disintegration (D), consistency (C), mealiness (M), humidity (H), structure (S) and flavour (F) are used. As the data on utilization-type are derived from the data on other characteristics, this dependent characteristic has not been included.

The following conclusions may be drawn:

1. The projections of the axes of characteristics on the plane of widest variation are almost identical in both years.
2. Mealiness (M), disintegration (D) and humidity (H) are the better indicators of varietal differences. Varietal differences may be caused to a much less extent by consistency (C) and structure (S). Flavour (F) plays no part at all in the plane considered.
3. The grouping of the projected variety means, as influenced by the investigated characteristics is mainly round the mean regression line of these means.
4. The grouping of the variety means is in close agreement with the grouping found by the data on utilization-type.
5. This indicates that the utilization-type is in the first place defined by the characteristics, mealiness, humidity and disintegration. Structure and consistency only play a minor part in the determination of utilization-types, whereas flavour plays no part (the latter is in complete corresponding with the agreements on the system of quality assessment.

DISCUSSION

Proudfoot: What method do you use for picking standardized samples and do you standardize the cooking time?

Lugt: We use tubers of approximately the same size six or seven tubers per sample.

Lugt: The cooking time is not standardized. We control every sample apart if it is done or not.

Haisma: For assessing the utilization type you do not mention smell and taste. I need smell and taste in the assessment of seedlings. It will be difficult and not objective but I must know if a seedling has a good taste or not.

Lugt: Flavour cannot be classified as good or bad. Good and bad is a question of personal taste and can vary from country to country. Flavour should be measured quantitatively as mild and strong and kept out of the assessment of utilisation type.

Münster: I agree with Lugt that the main purpose of the cooking-test should be to assess the utilization type, independent of flavour. The assessment of flavour gives additional information.

EUROPEAN ASSOCIATION FOR POTATO RESEARCH

Working group "Potato Quality Research"

Table I Cooking quality assessment of potato varieties after the utilization type

	1	2	3	4
Disintegration	No disintegration	Slight disintegration	Moderate disintegration	Complete disintegration
Consistency	Firm	Fairly firm	Fairly soft	Soft, with unequal consistency
Mealiness	Not mealy	Slightly mealy	Mealy	Very mealy
Humidity	Humid	Slightly humid	Slightly dry	Dry
Structure	Fine	Fairly fine	Fairly coarse	Coarse
Colour	1 = white 4 = light yellow	2 = greyish white 5 = yellow	3 = cream 6 = deep yellow	
Flavour	Tasteless	Fairly pronounced	Pronounced	Strong
Discolouration	Not discoloured	Slightly discoloured	Moderately discoloured	Very discoloured

Sample number								
Disintegration Consistency Mealiness Humidity Structure								
Utilization type								
Colour Flavour Remarks (off-flavour etc.) Discolouration Discolouration index								

Utilization type A: salad potato
B: Fairly firm all-purpose potato
C: Mealy potato
D: Very mealy potato

Preparation method: Steaming of hand peeled tubers without addition of salt

"DIE TYPISIERUNG VON SPEISEKARTOFFELN"

E. Höppner

Bundessortenamt, Rethmar

In dem Referat "Die Typisierung von Speisekartoffeln" wurde eine mit Herrn H. Geidel, Braunschweig-Völkenrode, erarbeitete Methode aufgezeigt, gekochte Kartoffelproben bestimmt, , vorher definierten Typen eindeutig zuzuordnen. Zur Demonstration der Methode wurden als Beispiele Eigenschaftskombinationen von 10 Eigenschaften herausgegriffen, die in Ausdehnung der international festgelegten Kochtypen weitere solche Eigenschaften umfassen, die zur Speisequalität einer Kartoffel beitragen.

Die Methode enthält alle Kombinationsmöglichkeiten der einzelnen Eigenschaften und ihren Abstufungen und berücksichtigt gleichzeitig eine in der Natur immer wieder vorkommende Schwankungsbreite. Die Beispiele waren so gewählt, dass sie zu Kombinationen führten, die in der Bundesrepublik Deutschland als: Salatkartoffeln; gute Speisekartoffeln, festkochend; gute Speisekartoffeln, lockerkochend; mässiggute Speisekartoffeln (Eintopfkartoffeln) oder diesen Typen nicht zuzuordnen (keine Speisekartoffeln) bewertet werden können.

Es wurde darauf hingewiesen, dass die Anzahl der zu dem Komplex gehörenden Eigenschaften, den man als Ganzes zu beurteilen wünscht, je nach Belieben verringert oder vergrössert werden kann. Man kann z.B. auch lediglich die Eigenschaften auswählen, die zur Definition der Kochtypen A - D herangezogen worden sind. Man kann ausserdem die Ausdrucksweise der einzelnen Abstufungen abändern, wenn man feststellen sollte, dass die im Beispiel gewollte Vorstellung nicht garantiert ist Für wünschenswert wird es jedoch unbedingt erachtet, dass die bei Festlegung der Kochtypen vereinbarte Abstufung von 4 Grupen innerhalb einer Eigenschaft innegehalten wird und dass die Worte, die jeweils im Hinblick auf den Kosterkreis gewählt werden, die gleiche Vorstellung erwecken, die - soweit sie bei den Definitionen der Kochtypen überhaupt herangezogen wurden - diesen entsprechen.

Die Ausführungen beschäftigten sich weiter mit der technischen Abwicklung beim Test solcher Speisekartoffeltypen und brachten Testschemen dafür in Vorschlag. Um nach diesem Schema gekochte Kartoffelproben auswerten zu können, wird eine Zahlentabelle benötigt, die auf Wunsch bei der Referentin angefordert werden kann.

DISCUSSION

Siebeneick: This method gives the possibility of definitely classifying every sample into a certain type. No classification in between 2 types, consequently this method is an advance to the international method.

Lugt : You assess 10 characteristics for the classification into types, but why are disintegration and mealiness missing?

Höppner : Disintegration is included in consistency in our system. Concerning mealiness it is my experience that many people can not discriminate mealiness from consistency, so that we do not assess these 2 characteristics separately. Our characteristic consistency therefore is more complex and includes disintegration and mealiness. But these characteristics can be taken up again if any country wants to use this system.

The advantage of this system is that every variety is classified into a type and we even can say if the variety is e.g. just type B or exactly type B.

Lugt : Do you use this system in tests by consumers?

Höppner : No, we only use this system for the classification of varieties. In tests by consumers we ask for the appreciation. We just ask if a certain type of potatoes is good or not in tests by consumers.

Keller : I propose to wait for the results Mrs. Höppner will have with this system and than complete our international method with this system.

AN INSTRUMENTAL METHOD OF DETERMINING THE SOFTNESS OF MASHED COOKED POTATO

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An instrument developed by Wolodkewitch and described by Grunewald (1957)[x] has been modified to permit more sensitive recording than was possible with the mechanical system used originally. The recording drum and arm have been replaced by a transducer with its slide resting on the tension spring cap. A variable e.m.f. is fed across the transducer imput, and its output, which is proportional to the extension of the spring, is fed into a recording potentiometer having a variable chart speed ranging from 1" to 9" per minute.

The instrument can be quickly adapted to measure resistance to penetration, crushing, shearing, tearing, etc. but its innovation lies in its ability to measure the resistance of soft foodstuffs to extrusion forces. The "gap method" described by Grunewald is particularly suitable for mashed potatoes. A cylindrical cavity is filled with the sample, and a plunger of external diameter less than the internal diameter of the cylinder is driven through it at constant speed. A graph is traced, whose area is proportional to the total work done in extruding the sample through the gap, and the smoothness of the sample can be assessed from the fluctuations shown by the trace.

x) Grunewald, Th. (1957) Zeitschrift für Lebensmittel Untersuchung und -Forschung 105, 1-12

Samples of European varieties exchanged in 1961/62 were assessed by means of

7. Dr. Höppner will have made colour scales which are fast and washable. There will be separate colour scales for raw and cooked potatoes. The participants showed great interest for this colour scales. Proofs of the scale for cooked potatoes will be made and sent to some of the participants. The matter will be worked out at Pisa.
8. Dr. Keller called attention to the fact of bringing uniformity in the schemes for judging various characteristics of varieties on the trial fields (scale of figures), e.g. resistance against diseases.
9. Dr. Siebeneick gave his view on the work done until now and on the aims he saw in the future. We have succeeded in giving uniform descriptions of potato quality characteristics and in working out a system to classify the varieties in the types A, B, C and D. Important is that this classification is not depending on the appreciation by the experts.

   The classification may be influenced by differences in cooking time or differences in thickness of the peelings. We might standardize this in the future.

EXCURSION

With the sun shining brightly the excursion departed at Cambridge for Ramsey, Hunts, to visit the Packing Station of E.P. Brands. In this packing station potatoes are soaked and transported in a gutter with running water to the washing-machine. If this soaking in the gutter is insufficient the potatoes are put into a special soaking tank for about 20 min.

After soaking the potatoes are washed in a Lockwood washing machine with a capacity of 9 tons an hour. After the potatoes have been washed and dried they are graded and sorted and then packed in small transparent bags containing about 2½ kg or in paper bags containing 50 kg.

The second visit on the programme was to the commercial form of A.K. Carter, Tydd Manor. The farm is situated in the most intensive agricultural area of England. On this farm fallow crops were grown on a little over 30% of the land. Potato fields have been shown with an excellent crop of the variety King Edward. Loose potatoes are stored in a store of asbestos isolated with straw-bales they can be piled up to 3½ m. The store could contain about 450 tons.

The third visit was paid to the Terrington Experimental Husbandry Farm, National Agricultural Advisory Service, F.E. Shotton Director. Work in progress on the influence of temperature on the length of the sprouts of seed potatoes was explicated. Seed potatoes were sprouted at 5, 10 and 23°C. These treatments showed great differences in the length of sprouts but small differences in yield. The influence of light intensity on sprouting neither gave great differences in yield. Furthermore experiments were shown on the control of slug damage to main crop potatoes. These experiments are important as damage by slugs ran up to £70 per ha in 1961.

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