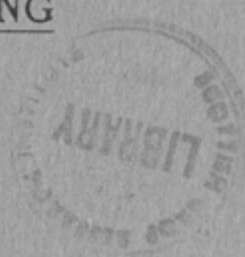


SCOTTISH SOCIETY FOR RESEARCH
IN PLANT-BREEDING



REPORT

BY THE

DIRECTORS

TO THE

ANNUAL GENERAL MEETING

27th July 1925



1925

ADS

LIBRARY
Scottish Crop Research Institute
Invergowrie
Dundee DD2 5DA

SCOTTISH SOCIETY FOR RESEARCH IN
PLANT-BREEDING.

REPORT.

IN submitting the fourth Annual Report to the Members of the Scottish Society for Research in Plant-Breeding, the Directors are pleased to record that the progress made during the past year is encouraging.

It can now be said that a few of the new selections of Oats and Potatoes which have been evolved and multiplied at the Station show distinct promise.

Full details of the research work carried out at the Station at East Craigs, Corstorphine, during the past year are given in the Report by the Director of Research, which appears on pages 13-36 hereof.

Financial.

The audited accounts for the year 1924-25 show a decrease of £157, 2s. 4d. in the Society's Funds at 31st March 1925, as compared with the corresponding figure at 31st March 1924. There is an increase in ordinary expenditure of over £27, and a decrease in ordinary income of £97, as compared with the corresponding items last year. The various items of ordinary expenditure do not vary widely from those of the preceding year. The purchase of a Rototiller constituted the main item of capital expenditure, and the purchase is included under the heading "Implements and Tools." This implement has been found to be very useful for various kinds of work at the Station.

The chief assets in the Balance-sheet remain at the same figures as last year.

A sum of £941, 7s. 3d. was received from the Development Fund, through the Board of Agriculture for Scotland, towards maintenance expenditure for the year ending 31st March 1924.

It is satisfactory to report that, as a result of an application to the Board of Agriculture for an increased grant, the Society has now been informed that, for the year ending 31st March 1925, the Board have been authorised to make a grant to the Society of a sum not exceeding £1541, to meet the deficit on the maintenance expenditure during that year. This means that the total deficit on approved expenditure for the year will be met by the grant, without taking into account, as formerly, the amount of interest on the original grant of £22,500 from the Agriculture (Scotland) Fund.

The Wilson Memorial Fund now stands at £211, 5s., being an increase of £10 for the year.

Membership.

The Society consists of 102 life members and 85 annual members ; 3 life members and 9 annual members were enrolled during the year. It is desirable that there should be a large increase in the membership of the Society, in order that the Plant-Breeding work may develop as rapidly as possible.

Donors of £20 or over (including donations to the Preliminary Fund) are entitled to become life members without further payment. Donors of £10 or over may become members of the Society by payment of an annual subscription of 10s., and others by payment of an annual subscription of £1.

Director of Research.

In January, Mr Montagu Drummond, B.A., F.R.S.E., F.L.S., intimated his resignation of the post of Director of Research, in consequence of his appointment to the Chair of Botany in

the University of Glasgow, his resignation taking effect as at 31st March.

In agreeing to accept the resignation, the Directors placed on record their appreciation of the valuable work which Mr Drummond had done for the Society during the four years in which he occupied the position of Director of Research at East Craigs.

At a special meeting of Directors on 8th June 1925 the Directors decided to appoint Mr William Robb, N.D.A., C.D.A. (Glas.), to the office of Director of Research. Mr Robb has been since 1920 Assistant Director at the Station. Prior to joining the staff of the Society, he had considerable experience of Plant-Breeding as assistant to the late Dr John Wilson at St Andrews University.

Trustees.

During the year under review a vacancy occurred in the Board of Trustees through the Right Hon. William Adamson, M.P., vacating the office of Secretary for Scotland.

The Right Hon. Sir John Gilmour, Bart., M.P., D.S.O., of Montrave, the present Secretary for Scotland, has kindly agreed to accept office as a Trustee.

Directorate.

The Directors regret to record that during the past year the Society lost, through death, the services of Sir James Campbell, LL.D., who had been a valued member of the Board since the institution of the Society. He took a deep interest in the affairs of the Society, and his loss is greatly lamented. To fill the vacancy thus caused, the Directors appointed Sir David Wilson, D.Sc., of Carbeth, Bart., who had been a member of the Board from its inception up till July 1924.

Election of Directors.

In accordance with the rules of the Society, the six senior Directors retire at this time. Their names are as follows :—

- Mr D. L. BOWE (Messrs J. H. Bowe & Sons), Dunbar.
 Lord FORTEVIOT, Dupplin Castle, Perth.
 Mr J. H. MILNE HOME, Irvine House, Canonbie.
 Mr JOHN M'CAIG of Belmont, Stranraer.
 Principal W. G. R. PATERSON, West of Scotland Agricultural College,
 6 Blythswood Square, Glasgow.
 Sir DAVID WILSON of Carbeth, Bart., D.Sc., Killearn (appointed May
 1925).

To fill the vacancies thus created, the Directors recommend the election of the following :—

- Mr WILLIAM CUTHBERTSON, V.M.H. (Messrs Dobbie & Co., Ltd.),
 Edinburgh.
 Mr J. INGLIS DAVIDSON, Saughton Mains, Corstorphine.
 Mr J. M. HANNAH, Girvan Mains, Girvan.
 Mr GEORGE G. MERCER, J.P., Southfield, Dalkeith.
 Mr G. B. SHIELDS, Dolphingstone, Tranent.
 Sir DAVID WILSON of Carbeth, Bart., D.Sc., Killearn.

JOHN STIRTON,
Secretary.

[ABSTRACT OF ACCOUNTS

ABSTRACT OF

For year ended

	<i>INCOME.</i>
Subscriptions—	
Life	£15 0 0
Annual	66 10 0
	£81 10 0
Donations	21 1 0
Interests	1,864 0 8
Rents	15 0 0
Income Tax Recovered	262 5 8
Sale of Produce and Stock on Hand	249 16 4½
	Total Ordinary Income
	£2,493 13 8½
Grant from Board of Agriculture—for year ended 31st March 1924	941 7 3
	Total Extraordinary Income
	£941 7 3
	Total Income
	£3,435 0 11½
Funds at 1st April 1924—	43,002 4 6½

£46,437 5 6

ACCOUNTS.

31st March 1925.

	<i>EXPENDITURE.</i>
Salaries—	
Officers	£1,533 10 6
Secretary and Office	220 0 0
	£1,753 10 6
Labour	772 14 6
Seeds and Roots	12 19 11
Manures	116 1 3
Locality Trial of Potatoes, Oats, &c.	4 15 9
Working Expenses, including renewals of Implements and Tools	225 6 1
Laboratory Expenses	50 7 8
Library Expenses	43 2 7
Rates and Taxes	276 7 3
Insurances	22 10 6
National Health and Unemployment Insurances	10 2 7
Office Expenses	72 3 10
Advertising	25 10 4½
Heating, Lighting, and Cleaning	33 16 1
Travelling Expenses	57 0 9
Property Repairs	63 6 10
Depreciation	52 6 10
	Total Ordinary Expenditure
	£3,592 3 3½
Capital Expenditure—	
Implements and Tools	£176 16 6
Office Fittings	10 2 6
Manures for Crop, 1925	75 10 1
	Total Capital Expenditure
	£262 9 1
Funds at 31st March 1925, per Balance-sheet	42,845 2 2½
	£46,437 5 6

BALANCE

As at 31st

LIABILITIES.

I. Accounts Outstanding	£298 19 8
II. Funds at 31st March 1925	42,845 2 2½



£43,144 1 10½

DR WILSON

Funds at 31st March 1925	£211 5 0
------------------------------------	----------

£211 5 0

EDINBURGH, 25th May 1925.—I, the undersigned, having had access to all the Accounts, and verified the same with the Accounts and Vouchers relating thereto, now
45 QUEEN STREET.

SHEET.

March 1925.

ASSETS.

I. House and Lands (at Cost)	£7,813 16 4
II. Implements and Tools	563 17 1
III. Laboratory Apparatus	186 18 5
IV. Office Fittings	107 9 0
V. Stocks on Hand	186 7 0
VI. Accounts Outstanding	37 18 1½

VII. Investments at Cost :—

Value at 31st March 1925.	
£14,245 0 0	1. £14,000 5 per cent War Stock, 1929/47 £12,390 0 0
12,390 0 0	2. £14,000 4 per cent Funding Stock, 1960/90 10,045 0 0
13,013 0 0	3. £16,900 3½ per cent Conversion Stock 11,140 3 6
500 0 0	4. £500 Edinburgh Corporation Loan 500 0 0
<u>£40,148 0 0</u>	<u>34,075 3 6</u>

VIII. Cash Balances—

In Bank—

On Current Account	£146 1 4
On Hand	26 11 1½

172 12 5

£43,144 1 10½

MEMORIAL FUND.

Value at 31st March 1925.

£203 10 0	£200 5 per cent War Stock, 1929/47—valued at date of transfer	£176 5 0
	Interest to date	35 0 0

£211 5 0

Books and Accounts of the Society, and having examined the foregoing Statement of sign the same as found to be correct, duly vouched, and in accordance with law.

W. SLATER BROWN, C.A., *Public Auditor.*

31st March 1925.

ANALYSIS OF MEMBERS.

Aberdeen 5	Lanark. 4
Argyll 2	Linlithgow 3
Ayr 21	Mid-Lothian 21
Banff 1	Moray 2
Berwick 9	Nairn
Bute	Orkney 2
Caithness 1	Peebles 3
Clackmannan	Perth 14
Dumbarton 2	Renfrew 16
Dumfries 10	Ross and Cromarty 6
East Lothian 24	Roxburgh 4
Fife 13	Stirling 1
Forfar 7	Sutherland 1
Inverness	Wigtown 3
Kincardine 1	England 1
Kinross 2	
Kirkcudbright 8	
	<hr style="width: 10%; margin-left: auto; margin-right: 0;"/> 187

ESTABLISHMENT FOR 1924-25.

BOARD OF DIRECTORS.

Trustees.

- THE RIGHT HON. WILLIAM ADAMSON, M.P., Secretary for Scotland.
 THE RIGHT HON. VISCOUNT NOVAR OF RAITH AND NOVAR, P.C.,
 G.C.M.G., Raith, Kirkcaldy.
 JAMES ELDER, Athelstaneford Mains, Drem.
 DAVID BELL, 15 Coburg Street, Leith.
 JOHN FINLAYSON M'GILL, 69 Kyle Street, Ayr.

Ordinary Directors.

1922.

- D. L. BOWE (Messrs J. H. Bowe & Sons), Dunbar.
 Sir JAMES CAMPBELL, LL.D., 14 Douglas Cres., Edinburgh. (*Deceased.*)
 LORD FORTEVIOT, Dupplin Castle, Perth.
 J. H. MILNE HOME, Irvine House, Canonbie.
 JOHN M'CAIG of Belmont, Stranraer.
 Principal W. G. R. PATERSON, West of Scotland Agricultural College, 6 Blythswood Square, Glasgow.

1923.

- Sir ISAAC CONNELL, S.S.C., 18 Duke Street, Edinburgh.
 JAMES HISLOP ELDER, B.Sc., Athelstaneford Mains, Drem.
 CHARLES E. GREGOR, Innerwick, East Lothian.

- THOMAS HOGG (Messrs Alex. Cross & Sons), 19 Hope Street, Glasgow.
 WILLIAM J. REID, Fordhouse of Dun, Montrose.
 JOHN SPEIR, Newton Farm, Hallside, Glasgow.

1924.

- JAMES CRUICKSHANK, Kilmarnock Arms, Cruden Bay.
 JAMES W. DRUMMOND (Messrs W. Drummond & Sons, Ltd.), Stirling.
 JAMES GARDNER, South Hillington, Cardonald.
 A. W. M'ALISTER, Seedsman, Dumfries.
 J. T. M'LAREN, The Leuchold, Dalmeny.
 ROBERT MILLER, Ferrygate, North Berwick.

Directors Co-opted.

- WILLIAM CUTHBERTSON, V.M.H. (Messrs Dobbie & Co., Ltd.), Edinburgh.
 J. INGLIS DAVIDSON, Saughton Mains, Corstorphine.
 G. BERTRAM SHIELDS, Dolphingstone, Tranent.

Directors nominated by the Board of Agriculture.

- Sir ROBERT B. GREIG, M.C., LL.D.,
 JAMES WOOD, O.B.E., M.A., B.Sc.,
 T. ANDERSON, M.A., B.Sc.,
 ALEXANDER M'CALLUM, M.A., LL.B.,
- } York Buildings, Queen Street,
 Edinbrough.

Chairman of Directors—JAMES ELDER, Athelstaneford Mains, Drem.

Vice-Chairman—DAVID BELL, 15 Coburg Street, Leith.

Director of Research—MONTAGU DRUMMOND, B.A., F.R.S.E., F.L.S., Craigs House, Corstorphine.

Secretary—JOHN STIRTON, 3 George IV. Bridge, Edinburgh.

Assistant Director and Assistant Secretary—WILLIAM ROBB, N.D.A., Craigs House, Corstorphine.

COMMITTEES.

1924-25.

RESEARCH.

G. Bertram Shields, *Convener*.
 T. Anderson.
 James Cruickshank.
 William Cuthbertson.
 J. W. Drummond.
 James H. Elder.
 James Gardner.
 Sir Robert B. Greig.

Thomas Hogg.
 A. W. M'Alister,
 J. F. M'Gill.
 Principal W. G. R. Paterson.
 William J. Reid.
 James Elder, *Chairman, ex officio*.
 David Bell, *Vice-Chairman, ex officio*.

MANAGEMENT.

David Bell, *Convener*.
 D. L. Bowe.
 James Cruickshank.
 J. Inglis Davidson.
 Charles E. Gregor.
 J. H. Milne Home.

J. T. M'Laren.
 Robert Miller.
 G. Bertram Shields.
 John Speir.
 James Wood.
 James Elder, *Chairman, ex officio*.

FINANCE.

J. H. Milne Home, *Convener*.
 David Bell.
 Sir James Campbell, LL.D.
 Sir Isaac Connell, S.S.C.
 Lord Forteviot.
 John M'Caig.

Alex. M'Callum.
 Viscount Novar, P.C., G.C.M.G.
 G. Bertram Shields.
 James Elder, *Chairman, ex officio*.
 David Bell, *Vice-Chairman, ex officio*.

R E P O R T

BY

DIRECTOR OF RESEARCH.

I. Research Programme—for 1924.

A. CEREALS.

Oats.—Area, 6 acres. Division V. (Breeding and Small Trial Plots), Divisions III. and VIII. (Multiplication Plots).

Manuring :—

Breeding Plots—

Superphosphate, 30 per cent . . . 2 cwt. per acre.

Other Plots—

Superphosphate, 30 per cent . . . 2 cwt. per acre.

Muriate of Potash . . . $\frac{1}{2}$ " "

Sulphate of Ammonia . . . $\frac{3}{4}$ " "

Eel-worm and wire-worm again caused much damage, especially in the small plots, and it is proposed to increase the amount of artificial manures applied, and to apply nitrate of soda and sulphate of potash instead of sulphate of ammonia and muriate of potash, so as to minimise as far as possible the damage caused by these pests.

Breeding.—The routine breeding work was continued as described in previous reports; Potato, Sandy, and Tam Finlay hybrids constitute a large proportion of the breeding stocks. The number of hybrid selections sown in 1924 was over 200, representing about thirty different crosses. These selections varied in age from the F_1 generation to the F_7 generation. Although some of the selections were severely thinned out by soil pests, plants from all the selections were secured at harvest. While many of the selections are still

segregating, a small proportion of fixed types is now in the preliminary trial stages. In addition to selecting early and improved types of the Potato, Sandy, and Tam Finlay varieties, attention is also being given to the selection of short stiff-strawed plants which give promise of good grain yield. The experiments carried out in connection with the testing of the yielding capacity of apparently fixed hybrid selections on the basis of yield per plant from a representative number of plants were continued. Controls were also grown of pure lines of Sandy, Potato, and Victory varieties for comparison. While the number of plants harvested was smaller than was intended, the results obtained even from the smaller number indicate that the method may yet prove useful for testing small stocks. In future it is hoped to have selections grown in small plots in which the grains are sown separately, for comparison with the same selections grown in larger plots in which the grain is sown at the usual rate of seeding and the yield of grain estimated in the usual way. It is desirable to have the controls also grown under both sets of conditions in order to allow of satisfactory comparisons being made. It is as yet premature to draw any conclusions regarding the method of estimating yields on the basis of yield per plant, but it may illustrate the method which is being followed by giving the data as regards yield per plant obtained from one of the controls, Potato (pure line), and that from a hybrid in the F_2 generation (see Figs. 1 and 2). The yields are plotted to give a frequency curve. The curve shown by Potato is practically what would be expected to be obtained from a pure line; the curve is nearly symmetrical. The hybrid, on the other hand, shows a different type of curve, which is asymmetrical. The hybrid was thought to be fixed, at least with reference to the more obvious morphological characteristics, but the curve suggests that the hybrid selection may be unfixed as regards yielding capacity; there may be two types, each having a different yielding capacity, but, so far as can be observed by eye, similar in appearance. By harvesting and threshing each plant separately in each successive generation, it should be possible ultimately to isolate the two different types if they are of different genetic constitution.

Crossing.—As much as possible of the available time was spent during the season in cross-pollinating oats, particularly early-ripening varieties. Crossing was carried out both in

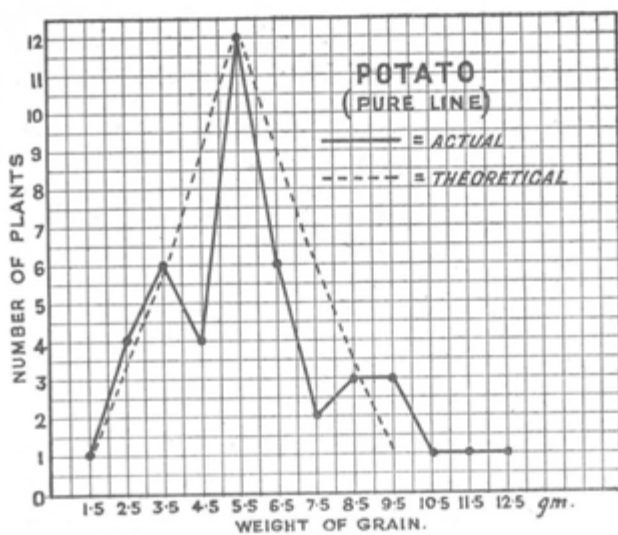


FIG. 1.

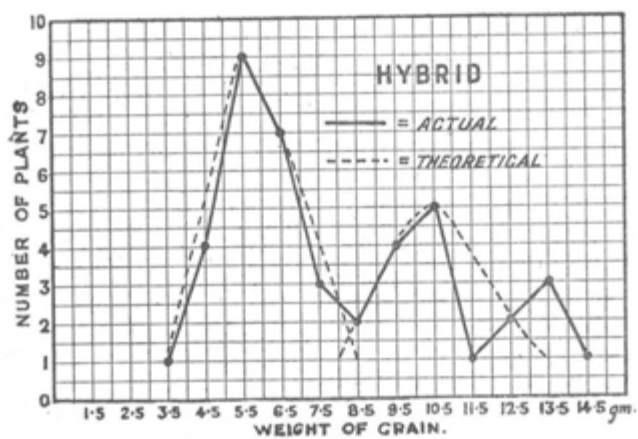


FIG. 2.

the field and in the greenhouse. Various methods were tried, and better results than formerly have been obtained as a result of improved technique. About 30 per cent of the cross-pollinated florets set grain, and many of the grains secured are from early-ripening parents.

Named Varieties.—One hundred and sixty-two cultures of named varieties, as shown in Table I., were grown as in previous years; many of these are pure lines. Pure line selections of Potato, Sandy, and Tam Finlay were further multiplied in one-tenth acre plots; each pure line of the three foregoing varieties was sown in duplicate. These varieties were harvested in good condition, but as the plots were so severely damaged by insect pests no satisfactory comparison of yields can be made.

Inheritance of Ear-Type.—Grains from a number of typical ears from plants of the F_4 generation, including those illustrated in last year's Report (Fig. 4), were grown in pots instead of in the field. Certain ear-types were found to be breeding true, some others were found to be segregating, while certain others produced no plants having ear-types the same as that of the parent plant.

The ears illustrated in Fig. 3 are from plants the progeny of the two ears shown in Fig. 4. The ear of the parent plant is directly underneath its progeny. This result indicates that there may be a very wide range of fluctuation apart from variation in ear-type amongst the resulting hybrids when a plant having an open spreading ear is crossed with a plant having a close one-sided ear.

Multiplication of Glebe Oats.—Two acres of this oat were sown. It was originally raised by the late Dr Wilson, and is of the Potato type, but the grain can be distinguished from the Potato Oat fairly easily. The weather before and at harvest was very unfavourable, but the crop ripened satisfactorily, and there was no lodging. The Committee on Co-ordinated Field Trials of the Scottish Agricultural Research Council have agreed to include Glebe in their Variety Trials for 1925. All three Agricultural Colleges in Scotland have also agreed to grow Glebe oats in at least six different trials in each of their respective areas. Glebe has already been tried in East Lothian and in Ayrshire, and reports from these trials indicate that this variety is worthy of further trial on an extended scale.

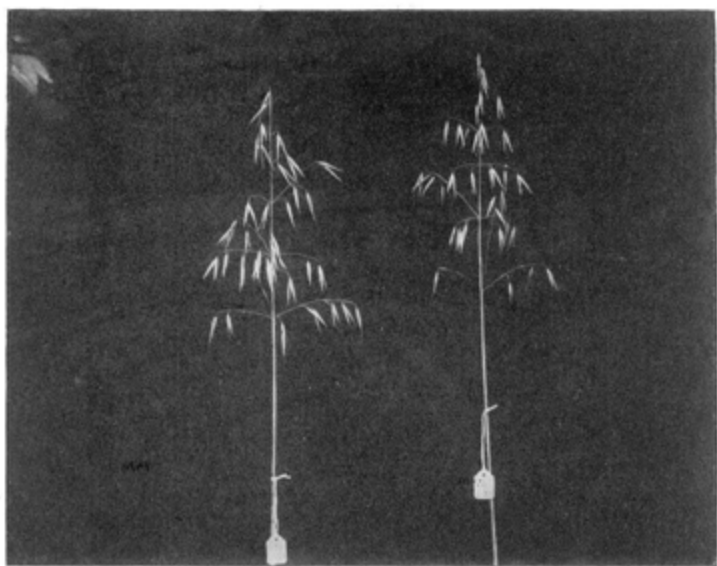


FIG. 3.

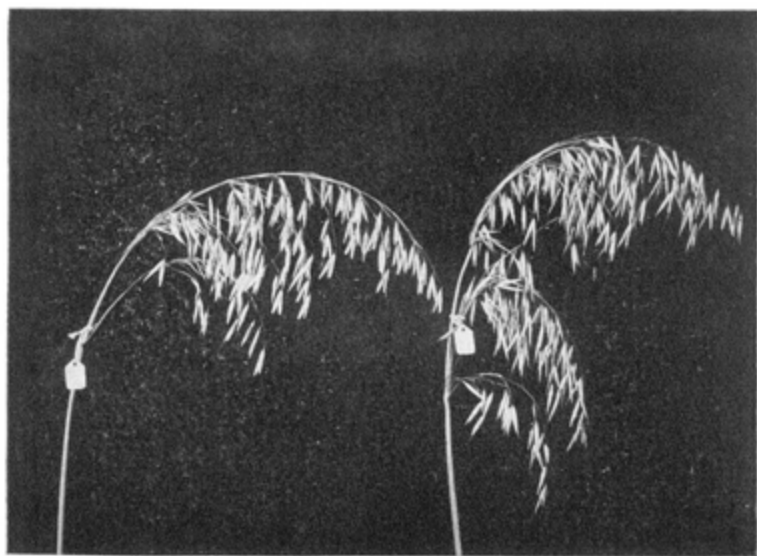


FIG. 4.

TABLE I. OATS—COLLECTION OF NAMED VARIETIES.

* = Pure Lines.

Name of Variety.	Station Number.	Name of Variety.	Station Number.
A. Brevis	Aa F1	Bathurst 16	Aa 439
A. "	" 2	Beardless Propsteier	" 31*
A. chinensis	" C4	Bell	" 76*
A. nuda	" 2	Beseler's Prolific	" 387
A. orientalis	" 422	" "	" 27
A. " tristis	" 424	" "	" 32*
A. " tartarica	" 423	Big Four	" 389
A. "	" 425	" "	" 383*
A. sativa aurea	" 413	Black Mesdag	" 77*
A. " "	" 426	" Mogul	" 89*
A. " brunnea	" 416	" Tartarian	" 93*
A. " montana	" 427	Blainslie	" 8*
A. " mutica	" 415	Californie	" 49*
A. " nigra	" 414	Captain	" 48*
A. " praegravis	" 428	Castleton Potato	" 11*
A. " trisperma	" 417	" Sandy	" 381*
A. sterilis × Golden Rain	" 429	Chinese Naked	" C1
A. strigosa	" B1	Comewell	" 59*
A. "	" 2	Cowra 33	" 435
A. "	" 3	Crown	" 29*
Abundance	" 393*	Culberson	" 70
Alaska	" 443	Dala	" 22*
Algerian Red	" 94	Daubeny	" 23*
" Black	" 95	1000 Dollar	" 25*
" Grey	" 96	Dun	" 384*
" ex New Zea- land	" 448	Early Champion	" 53*
Algerian	" 62*	" Hamilton	" 12*
Ascot	" 44*	" Siberian	" 368*
Aurora	" 50*	Echo	" 405
Banner	" 38*	Eighty Day	" 21*
" Ottawa	" 444	Fortuna	" 407
Bathurst	" 432	Fulghum	" 52*
		Garris	" 104*
		Giant Yellow	" 61*

TABLE I.—*continued.*

Name of Variety.	Station Number.	Name of Variety.	Station Number.
Glebe	Aa 17*	Naked × Polish	Aa 409
Glen Innes	" 433	New Ascot	" 33*
" Innes 8	" 438	" Sandy	" 411
Golden Rain	" 65*	O.A.C. 72	" 447
Gordon	" 379*	Odal	" 36
"	" 385*	"	" 37
"	" 378*	"	" 408
Grange	" 18*	Orion	" 340
Guyra	" 434	Ostends Glory	" 57*
Hamilton	" 20*	Potato	" 10*
Hardy Winter	" 74*	"	" 396*
Hedehavre	" 72	"	" 397*
Hero	" 40	"	" 398*
Huskless	" C3	"	" 399*
Hutcheson	" 73*	"	" 400*
Idamine	" 386	"	" 401*
Iowar	" 58*	"	" 402*
Joanette Hybrid	" 75*	Prolific Pfeffelbacker	" 43
Kent Berlie	" 13*	Record	" 41*
Kherson	" 63*	"	" 24*
King	" 446	Red Oat	" 66*
Kinness	" 26*	Red Rustproof	" 67*
Lachlan	" 431	Richland	" 51*
Leader	" 47*	Ruakuras	" 406
Liberty	" 412	Sandy	" 2*
Ligowo	" 28*	"	" 3*
Lincoln	" 394	"	" 403
"	" 377*	Scots Berlie	" 16*
Mansholts I.	" 99	Sir Douglas Haig	" 90*
" II.	" 100	Sixty Day	" 60*
" III.	" 101	Sparrowbill	" 56*
Mortgage Lifter	" 451	Stable King	" 392
Mulga	" 430	Storm King	" 45*
Myrtle A	" 91	Sunrise	" 436
" B	" 92	Superb	" 445

TABLE I.—*continued.*

Name of Variety.	Station Number.	Name of Variety.	Station Number.
Supreme	Aa 88*	White Horse	Aa 395
Swedish Select	" 35*	" "	" 34*
" "	" 39I	" Russian I	" 54*
Tam Finlay	" 7*	" " 2	" 55*
" "	" 382*	" "	" 404
Terset's Potato	" 410*	Wide Awake	" 440
Trifolium	" 103*	" "	" 44I
Triumph	" 46*	Wilga	" 437
Triumphal	" 388*	Winter Turf	" 69*
Tyrone Tawny	" 7I	Wisconsin	" 390
Victory	" 30*	Yellow Naesgaard	" 64*
Waverley	" 9*	Yielder	" 42*
Wexford Tawny	" 68		

B. POTATOES.

Area, 2 acres : $1\frac{1}{2}$ acres Experimental, $\frac{1}{2}$ acre Commercial crop, all in Division VI.

Manures—

Stable Manure	15 tons per acre.
Superphosphate 30 per cent	3 cwt. " "
Sulphate of Potash	2 " " "
Sulphate of Ammonia	1 " " "

The potato-breeding work is progressing on the lines as indicated in previous reports.

Seedlings (raised from true seed in 1924).—The number of potato seeds sown was over 9,000. Many of these seeds were from the Wilson collection, some of which were over eight years old. In fifty selections the seed failed to germinate. There was practically no germination in seeds over eight years old. Amongst seed secured at the Station preference in sowing was given to hybrids from early-ripening varieties. Selfed

seed from Majestic, Bishop, and Golden Wonder was also sown with a view to breeding some homozygous strains. Many of the seedlings from the selfed plants, particularly in one series, seemed to lack vigour; but the season was not very favourable for potato culture, and that may have adversely affected them. A large selection of these seedlings, however, has been kept for further trial. The potato seeds were grown in the same way as in previous years. On account of the prevalence of leaf diseases amongst potatoes last year, the seedlings were lifted early in the season in order to minimise, if possible, the amount of infection. Some of the seedlings showed signs of these diseases at a very early stage. Over 200 selections of seedlings have been retained for further trial. Amongst these are the progeny of varieties which have been once selfed, and it is proposed to continue the selfing of some of these for breeding purposes.

As indicated in the Report for 1924, a high death-rate occurred amongst seedlings which were the progeny of early-ripening varieties. Some of the seedlings which died down early produced no tubers; but others produced a few small tubers, and selections from these have been retained for further trial. Possibly some early-ripening varieties may be found amongst them.

Trials of Varieties and Selections raised from Seed prior to year 1924.—These trials were continued as described in previous Reports. They consisted of 5-tuber tests, 12-tuber tests, 25-tuber tests, 50-tuber tests, and 100-tuber tests. The 50-tuber tests were in duplicates of 25, and the 100-tuber tests were in quadruplicates of 25. The 5-tuber tests were to a large extent composed of seedlings raised in 1923. The named varieties grown for comparison were Kerr's Pink, Great Scot, and Epicure, and were the progeny of stocks which had been grown at the Station in the previous year.

The selections of unnamed varieties comprised

205 5-tuber tests.	2 50-tuber tests.
45 12-tuber tests.	10 100-tuber tests.
14 25-tuber tests.	

The leaf diseases (leaf-roll and mosaic) were very prevalent amongst the stocks at the Plant-Breeding Station; some of the selections, however, were infected to a greater extent than others. Tubers were lifted early in the season from plants

which at the time of lifting were apparently free from leaf-roll and mosaic. These samples are to be used as seed, and the progeny compared with the progeny of the same varieties which were not lifted until the customary lifting time. It is desired to find out if early lifting of seed tubers is advantageous. The plots were inspected by the Potatoes Sub-Committee towards the end of the season, and representative plants from the varieties included in the 50-tuber tests and 100-tuber tests were lifted for inspection. The Committee, as in previous years, indicated their opinion of the merits of the seedlings as compared with the named varieties grown as controls.

Table II. shows the yields, &c., of the selections in the 100-tuber and 50-tuber tests only, together with those from the named varieties grown alongside. The yields in the smaller plots were also determined, but it is as yet too early to publish these. It will be seen from the figures in the table that season 1924 was less favourable for crop production than the previous year (1923). The average reduction in yield per plant in Great Scot and Kerr's Pink is not so great as in some of the seedlings. Varieties 480 (a) (41) and 480 (a) (48) show a large decrease in yield compared with the crop which each produced in 1923. The decrease was brought about chiefly by the affects of leaf-roll disease, to which these varieties seem very susceptible. These varieties in the two previous years were very promising as heavy croppers, and the great decrease in yield in these stocks indicates the rapidity with which some stocks "degenerate" at the Plant-Breeding Station. There are indications that varieties such as Kerr's Pink and Great Scot seem to be less readily affected with these degeneration diseases than other varieties. Two varieties which have so far been of merit as regards cropping power, shape of tuber, &c.—viz., 1 (13) and 1 (22)—apparently are also very resistant to blight. All the varieties were stored under the same conditions, and some of them developed blight to a much greater extent than others during the winter.

The figures in the third column (Ripening Period) have the following significance :—

- (1) Varieties which began to wither before 31st August.
- (2) Varieties which began to wither after 31st August and before 21st September.

(3) Varieties which began to wither after 21st September and before 10th October.

(4) Varieties which began to wither after 10th October.

As before, yields of varieties are shown on the basis of the average yield per plant from a known number of plants taken consecutively in the drill.

"Ware" includes all tubers passing over a $1\frac{3}{4}$ " riddle.

TABLE II. POTATOES, TRIALS OF UNNAMED SEEDLINGS.

Reference No.	Plot No.	Ripening Period.	Average weight of Tubers per Plant from different Plots, each of 25 Plants, 1924.	Average of 4 Plots.	Average weight of Tubers per Plant in 1923.	Percentage of ware by weight, 1924.	Average percentage of ware.	Percentage No. of Tubers in ware which developed Blight during winter.
100-TUBER TRIALS, 1924.								
1 (13) .	$\begin{pmatrix} 1 \\ 2 \\ 3 \\ 4 \end{pmatrix}$	4	$\begin{pmatrix} 2.4 \\ 2.4 \\ 3.2 \\ 2.7 \end{pmatrix}$	2.7	3.9	$\begin{pmatrix} 72.0 \\ 62.2 \\ 74.5 \\ 64.5 \end{pmatrix}$	68.5	2.5
*1 (21) .	$\begin{pmatrix} 1 \\ 2 \\ 3 \\ 4 \end{pmatrix}$	3	$\begin{pmatrix} 1.9 \\ 2.5 \\ 1.9 \\ 2.0 \end{pmatrix}$	2.1	3.2	$\begin{pmatrix} 81.0 \\ 69.1 \\ 75.0 \\ 77.1 \end{pmatrix}$	75.5	75.9
1 (22) .	$\begin{pmatrix} 1 \\ 2 \\ 3 \\ 4 \end{pmatrix}$	4	$\begin{pmatrix} 2.7 \\ 3.0 \\ 2.6 \\ 3.2 \end{pmatrix}$	2.9	3.7	$\begin{pmatrix} 69.2 \\ 66.04 \\ 61.4 \\ 61.2 \end{pmatrix}$	64.5	0.0
*40 (2) .	$\begin{pmatrix} 1 \\ 2 \\ 3 \\ 4 \end{pmatrix}$	2	$\begin{pmatrix} 1.9 \\ 1.6 \\ 1.6 \\ 2.0 \end{pmatrix}$	1.8	2.6	$\begin{pmatrix} 65.3 \\ 63.1 \\ 61.1 \\ 59.1 \end{pmatrix}$	62.2	{ No Tubers kept.
†296 (1) .	$\begin{pmatrix} 1 \\ 2 \\ 3 \\ 4 \end{pmatrix}$	2	$\begin{pmatrix} 2.8 \\ 2.2 \\ 2.1 \\ 2.2 \end{pmatrix}$	2.3	2.9	$\begin{pmatrix} 56.2 \\ 51.1 \\ 58.1 \\ 52.1 \end{pmatrix}$	54.4	22.9
480 (a) (7) .	$\begin{pmatrix} 1 \\ 2 \\ 3 \\ 4 \end{pmatrix}$	2	$\begin{pmatrix} 3.1 \\ 2.4 \\ 2.4 \\ 3.4 \end{pmatrix}$	2.8	3.2	$\begin{pmatrix} 57.2 \\ 47.1 \\ 54.2 \\ 59.4 \end{pmatrix}$	54.5	9.7
†480 (a) (41)	$\begin{pmatrix} 1 \\ 2 \\ 3 \\ 4 \end{pmatrix}$	2	$\begin{pmatrix} 2.7 \\ 1.9 \\ 1.4 \\ 1.5 \end{pmatrix}$	1.9	4.3	$\begin{pmatrix} 34.3 \\ 20.5 \\ 26.0 \\ 20.0 \end{pmatrix}$	25.2	70.1

*=Mosaic prevalent.

†=Leaf-roll prevalent.

TABLE II.—*continued.*100-TUBER TRIALS, 1924—*continued.*

Reference No.	Plot No.	Ripening Period.	Average weight of Tubers per Plant from different Plots, each of 25 Plants, 1924.	Average of 4 Plots.	Average weight of Tubers per Plant in 1923.	Percentage of ware by weight, 1924.	Average percentage of ware.	Percentage No. of Tubers in ware which developed Blight during winter.
†480 (a) (48)	$\begin{pmatrix} 1 \\ 2 \\ 3 \\ 4 \end{pmatrix}$	3	$\begin{pmatrix} \text{lb.} \\ 2.5 \\ 2.3 \\ 2.8 \\ 2.1 \end{pmatrix}$	2.4	4.0	$\begin{pmatrix} 62.4 \\ 71.4 \\ 66.6 \\ 71.4 \end{pmatrix}$	67.9	24.6
*655 (2)	$\begin{pmatrix} 1 \\ 2 \\ 3 \\ 4 \end{pmatrix}$	3	$\begin{pmatrix} 2.5 \\ 1.9 \\ 2.8 \\ 2.5 \end{pmatrix}$	2.4	3.4	$\begin{pmatrix} 55.3 \\ 42.1 \\ 44.8 \\ 55.0 \end{pmatrix}$	49.3	37.3
878 (3)	$\begin{pmatrix} 1 \\ 2 \\ 3 \\ 4 \end{pmatrix}$	4	$\begin{pmatrix} 2.6 \\ 2.4 \\ 1.9 \\ 2.6 \end{pmatrix}$	2.4	3.5	$\begin{pmatrix} 63.0 \\ 58.1 \\ 65.4 \\ 66.6 \end{pmatrix}$	63.2	9.3
Epicure	$\begin{pmatrix} 1 \\ 2 \\ 3 \\ 4 \end{pmatrix}$	1	$\begin{pmatrix} 2.3 \\ 2.9 \\ 2.4 \\ 2.6 \end{pmatrix}$	2.5	4.0	$\begin{pmatrix} 58.9 \\ 78.4 \\ 71.8 \\ 69.4 \end{pmatrix}$	69.6	43.4
Great Scot	$\begin{pmatrix} 1 \\ 2 \\ 3 \\ 4 \end{pmatrix}$	2	$\begin{pmatrix} 3.1 \\ 2.8 \\ 3.3 \\ 2.8 \end{pmatrix}$	3.0	3.5	$\begin{pmatrix} 78.3 \\ 75.0 \\ 73.0 \\ 69.7 \end{pmatrix}$	74.0	32.9
Kerr's Pink	$\begin{pmatrix} 1 \\ 2 \\ 3 \\ 4 \end{pmatrix}$	4	$\begin{pmatrix} 2.9 \\ 3.1 \\ 3.4 \\ 2.1 \end{pmatrix}$	2.9	3.2	$\begin{pmatrix} 79.5 \\ 74.4 \\ 78.7 \\ 61.1 \end{pmatrix}$	73.4	7.8

50-TUBER TRIALS.

*1 (19)	$\begin{pmatrix} 1 \\ 2 \end{pmatrix}$	4	$\begin{pmatrix} 2.5 \\ 1.7 \end{pmatrix}$	2.1	2.6	$\begin{pmatrix} 65.3 \\ 69.0 \end{pmatrix}$	67.1	3.44
*449 (a) (1)	$\begin{pmatrix} 1 \\ 2 \end{pmatrix}$	3	$\begin{pmatrix} 2.9 \\ 2.1 \end{pmatrix}$	2.5	4.5	$\begin{pmatrix} 75.6 \\ 65.2 \end{pmatrix}$	70.4	51.8

* = Mosaic prevalent.

† = Leaf-roll prevalent.

Wart Trials.—Single-tuber samples from 156 selections were sent to the Board of Agriculture Wart Immunity Trials at Philpstoun. Forty-two varieties were found to be susceptible to Wart Disease, and almost all of these have been dis-

carded. Those which have been retained are for breeding purposes.

Four seedling varieties were sent to Ormskirk for trial, and all four were found to be free from Wart Disease. The report from Ormskirk indicates that the four varieties yielded satisfactory crops under Ormskirk conditions.

Registration and Immunity Trials.—Samples from six selections were sent to these trials which are carried out by the Board of Agriculture for Scotland, and all the selections were found to be free from Wart Disease. Three of the selections have been recommended by the Synonyms Committee of the Board of Agriculture for Scotland for inclusion in the Maturity and Yield Trials at the Plant Registration Station in 1925, and they are being further multiplied at the Plant-Breeding Station. Two of the three varieties which were not recommended are not being multiplied on account of their susceptibility to leaf diseases. The other variety is being grown on a small scale at the Plant-Breeding Station this year for further trial.

Named Varieties.—Small stocks of sixty-two named varieties were also grown.

Locality Trials.—Samples of certain promising varieties were sent to growers in various districts in Scotland for trial. The reports received indicate how the varieties grew under different conditions. There are wide differences in the yields from the same selections when grown in different districts. For example, one variety grown in East Lothian under field conditions yielded 6.8 lb. per plant, and only 1.6 lb. per plant when grown under field conditions in Aberdeenshire. From the results of these trials it would appear that three varieties—1 (13), 1 (22), and 878 (3)—were, on the whole, of promise and worthy of further trial. Unfortunately, leaf-roll and mosaic are already present to a small extent in the stocks. One variety, 878 (3), was reported upon from one centre as being of very good cooking quality.

Demonstration Plot at the Plant-Breeding Station.—A small plot was allotted for purposes of demonstration, and in it samples of a few of the most promising selections were grown alongside of standard varieties. The varieties all grew vigorously, and produced heavy crops. The tubers were of good size, and were much better shaped than those grown in the field plots where the soil was of a heavier nature. This plot

was also inspected by the Potatoes Sub-Committee, and some of the selections were commented upon very favourably.

Boiling Tests.—Samples from some of the most promising selections grown at the Plant-Breeding Station were boiled (unpared) in the customary way, and three selections seemed particularly fine quality; they boiled drier than the Kerr's Pink sample. These selections are 878 (3), 964 (a) (13), and 965 (b) (1), the latter two are only two years from the berry, and were not included in the larger trials. Table III. shows the varieties which were tested, and the remarks made regarding cooking quality.

TABLE III.

Reference No.	Remarks made on Boiled Sample.
1 (12) R.	Dry, white.
1 (13)	Fairly dry.
1 (22)	Fairly dry, white.
17 (22)	Fairly dry, yellow.
20 (4)	Fairly dry, white.
480 (a) (41)	Wet, white, brown spots in flesh.
655 (2)	Wet, yellow.
480 (a) (48)	Fairly dry, white.
878 (3)	Very dry, white, skin broken.
884 (7)	Fairly dry, white, skin broken.
963 (b) (8)	Wet, white.
964 (a) (12)	Dry, skin broken.
946 (a) (13)	Very dry, skin broken.
964 (b) (5)	Dry, white, skin broken.
964 (b) (6)	Fairly dry, white.
965 (a) (7)	Slightly wet, yellow.
965 (b) (1)	Very dry, skin broken, white and mealy.
965 (b) (7)	Fairly dry, yellow.
965 (b) (14)	Fairly dry, white.
Kerr's Pink	Dry, white.
Great Scot	Fairly dry, white.

C. HERBAGE PLANTS.

During 1924 the experimental breeding of the chief agricultural grasses was continued, and more points of technique were investigated.

The following is a brief summary of the 1924 investigations. As regards artificial isolation, the results of experiments carried out last summer confirm the work of the previous year, and prove the suitability of the methods employed.

GENERAL PROBLEMS.

Self-Sterility.—Further experiments were carried out with plants which proved to be self-sterile in 1923, and the results show no increase in self-fertility.

Some general notes on self-pollination may be given here. The methods of artificial isolation were entirely satisfactory, in no way retarding fertilisation, as was proved by the following experiments:—

- (1) Plants which were self-sterile under artificial isolation continued to be equally self-sterile when allowed to flower exposed under natural isolation—*i.e.*, by time of flowering. The plants so isolated remained sterile only so long as foreign pollen was excluded, seeds being set whenever cross-fertile plants in flower were introduced into the same greenhouse.
- (2) When spikes or panicles on different self-sterile, but inter-fertile, plants were enclosed together in the same bag, the percentage of flowers setting seed equalled that of natural pollination. (A standard of fertility for normal uncut spikes or panicles is necessary with which to compare the results of these controlled crosses. This standard was taken as the maximum percentage of flowers which set seed when the spikes or panicles were freely exposed under natural conditions.)
- (3) When emasculated flowers were pollinated by hand with pollen from cross-fertile plants and enclosed, up to 100 per cent of fertilised flowers have been obtained.

- (4) The wild oat, *Avena fatua*, a species known to be self-fertile when enclosed, was found to be completely self-fertile, the actual figure being 97 per cent.

Self-pollination of the plants under experiment was repeated at intervals throughout the summer; and pieces of certain plants were subjected to three different sets of environmental conditions. In no case was there a definite increase in self-fertility as the season advanced, nor was there any increase due to the difference in environment.

As regards seed production within a clone (a plant multiplied vegetatively), the following experiment shows the necessity of determining whether a plant is self-sterile or not.

Plant 41 of Perennial Rye-grass (self-fertility = .6 per cent—4342 flowers, 28 seeds) was divided and planted in three plots, isolated as far as possible from other rye-grasses. At intervals throughout the entire season the number of flowers setting seed was noted.

The results are as follows:—

TABLE IV.

Approximate date of Flowering.	Number of Flowers.	Number of Seeds.	Percentage Flowers setting Seed.
June 10 . . .	738	55	7.5
June 26 . . .	1226	399	33.0
July 15 . . .	686	54	7.9
August 15 . .	1974	56	2.8
After August 15 .	962	80	8.3

The comparatively high percentage of seed set during the latter part of June is undoubtedly due to the fact that foreign pollen, from other plants of Rye-grass growing in the vicinity, was most abundant at that time. The low percentages set during the rest of the flowering season confirm the view, already arrived at from other considerations, that isolation in time, say, of a late-flowering stock is a method which might prove valuable in practice.

Breeding.—Some difficulty had been experienced in compar-

ing individual plants. This difficulty has been overcome by dividing the selected plants into eighteen pieces and planting these pieces in small plots. In this way the value of the plants can more readily and accurately be determined.

Another difficulty in the breeding work is that of recognising definite characters. Great variations do occur between individual plants, but which characters are inherited and which are merely due to alterations in the external conditions is a matter which has still, to a great extent, to be found out. The branching of the spike in the rye-grasses may be taken as an example. Certain plants may show branching of the spike one year, and be perfectly normal the following year. Several seedlings have been raised from such plants, and in a few of them the branching appeared. Now the question is: Is this an inherited character, or is it merely due to alterations in external conditions, or is the tendency inherited under certain conditions only? But it is with vegetative characters (*e.g.*, tillering capacity, habit of growth, whether flat or erect, and bulk of foliage) that we are mostly concerned, and these appear to be even more influenced by environment than are floral characters.

A considerable amount of work has been done on the tillering capacity of Perennial Rye-grass. The capacity for tillering appears to be inherited, but so far the results are not conclusive, since such a character is very liable to disturbance from external causes.

Phenotype Crossing (see 1923 Report, p. 26).—Phenotype crossing between twenty-five pairs of Perennial Rye-grass was carried out last summer. From the results of the crosses it appears that this method of breeding will repay further investigation. There is, however, some evidence of cross-sterility between certain of the pairs. It is intended this summer to carry out carefully-controlled experiments with inbred populations to determine whether cross-sterility is a problem which may require special consideration.

Collection of Material.—During last year many wild local populations of Perennial Rye-grass and Cocksfoot were collected from different parts of Scotland. Great differences are evident amongst different local populations; and in certain of these populations the individual plants resemble each other more or less closely.

Perennial Rye-Grass.

Last September forty-three lots of Perennial Rye-grass were sown in the greenhouse, twenty-five of these being obtained by the crossing of plants similar in external appearance.

Seven hundred and fifty seedlings from these lots were transplanted into $3\frac{1}{2}$ " pots and placed outside. Observations were made on these lines throughout the winter, both as regards habit of growth and tillering capacity. Some promising lines are in evidence. In addition to the above, ten lots of seed, from plants collected at John o' Groats, were sown in the greenhouse in January.

Thirty-five promising plants have been divided and planted in plots for further study and selection.

This year two clones have been interplanted at Mayshiel, East Lothian,¹ in order to determine if Perennial Rye-grass will seed in such a hill district, where there is natural isolation.

Cocksfoot.

The 1921 seedling Cc8 was divided into fifty-six pieces, and these pieces were allowed to flower freely exposed in a plot isolated as far as possible from other plants of Cocksfoot. Only 8 per cent of the flowers produced seed under these conditions. The actual number of flowers counted was 4427, from which 367 seeds were obtained.

Seed collected from plants growing wild in different districts of Scotland was sown in the greenhouse in January. A considerable number of plants from wild populations, which were collected last year, have been planted for purposes of selection.

Timothy.

Very few of the Timothy plants under observation show promise of being good pasture types. The great majority are tall growing and poor tillering plants. Two plants, however, have been selected as pasture types, and seed of these has been sown this year.

Wild plants of *Phleum pratense* and *P. alpinum* have been collected from various districts.

¹ Facilities for this experiment were kindly afforded by Major Houston.

Glovers.

Owing to the amount of time required for experimental work with the agricultural grasses, which work is an essential preliminary step to breeding on a large scale, little time was available for the study of clovers. At present a few plants of Wild Red Clover are being grown for observation.

D. SWEDES AND TURNIPS.

The procedure followed was similar to that outlined in previous Reports.

Pedigree Strains, Line Selections, and Hybrids.

Fifty-eight strains, the result of seeding in isolation (mainly cloth-fabric bags) individual roots representing thirteen commercial varieties of Swedes and five of Turnips, were sown in 1924. In the case of Swedes good crops of seed were available—viz., an average of 1100 seeds per strain—which gave a sufficient crop of roots, and enabled the value of the strains to be satisfactorily estimated. Turnips again proved refractory, not more, on the average, than 100 seeds per strain being available.

Swedes.—As in the previous year, the pedigree strains (chiefly Purple-Top) were noticeably more uniform than the parent commercial varieties. Where several roots of one variety (selected as being as nearly as possible typical) had been selfed, the resulting strains showed marked differences. This result gives encouragement to the belief that by continued selfing and isolation more or less fixed strains of desirable types will be obtained. Twenty-one of these strains were considered worthy to be continued for further observation, and four were recommended by the Roots Sub-Committee for immediate multiplication. Thanks are due to Mr C. E. Gregor, Innerwick; Mr J. F. M'Gill, Ayr; Lord Rosebery, Dalmeny; and Mr Wilson and Mr Smith, Cramond Island, for giving facilities for multiplication under natural isolation. It is hoped by this means to obtain a sufficient stock of seed for the first stage of field testing, and also to discover the best method of multiplication of promising strains.

Out of strain Da 41 there had been selected in 1923 two Tankard and two Globular roots. The resulting selfed strains

from the Tankard roots were longer than those from the Globular roots. It is intended to continue this line selection with a view to investigating the factor or factors determining bulb-shape.

Turnips.—Owing to the prevalence of self-sterility and consequent difficulty in obtaining satisfactory crops of selfed seed, the progress made with Turnips has not been so good as that with Swedes. One or two lines of investigation useful for future work have been started. Thus, a white root—probably a rogue—in Db 34 (Lincolnshire Red Globe) was selfed, and also hand crossed with a typical Lincolnshire Red Globe plant. The result of the selfing was four white roots, while the cross gave fifty-six roots (F_1), all red in colour. About thirty roots resulting from a similar cross (White \times Red) were sent for natural isolation to Mr G. G. Mercer, Southfield, Dalkeith, who has kindly undertaken the management of seed production in this case. The results of seeding these roots will throw some light on the inheritance of bulb colour.

The leaves of the Turnips were again very generally affected with variegation. While making little appreciable difference in yield or dry-matter content (the latter result is unexpected), variegation appears to affect seed production rather seriously. It does not seem to be genetic in nature; thus a variegated plant selfed in 1923 gave progeny which were not more affected than progeny of an unaffected root of the same stock. An external origin is also indicated by the fact that variegation was observed to spread from one or two plants to others as the season progressed.

Controlled Seedings.

Nintey-five individual roots from Swedes and Turnips were seeded in isolation (cloth fabric bags) in 1924. The majority of the Swedes belonged to lines already once selfed. Several crosses were also made. With a season favouring early ripening, plenty of Swede seed of good quality was obtained. An average crop of 1000 seeds per bag was collected from forty-six roots representing ten commercial varieties and line selections from these. With Turnips, nine selfings gave an average of only fifty seeds per bag. In thirty-four cases two Turnips plants of similar phenotype were bagged together in the hope that the effects of self-sterility would be overcome; in these

cases an average of ninety seeds per plant was obtained. This result was disappointing. It is intended in 1925 to cross-pollinate similar phenotypes by hand; the additional labour involved will be well expended if a greatly increased production of seed results.

"Dr Wilson" Swedes—Dry-Matter Determinations.

Strains arising from eight roots seeded in 1923 were available for analysis. In October-November thirty-six roots of each strain were sampled for dry-matter content, and the sampling was repeated with a further thirty-six roots of each strain in the spring. The means of these samplings are shown in Table V. Da W 43, and Da W 44 have arisen from two sister roots of Da W 17 (see Annual Report 1923, p. 40, Table XII.), one of low and the other of high dry-matter content. Da W 47 and Da W 48 are a similar pair derived from the progeny of a cross.

TABLE V.

Parent Strain.	Mean D.M.C. % of Parent Strain (1922).	D.M.C. % of Parent Root.	Strain.	Mean of D.M.C. % in		Average of A. and S.
				Autumn (A).	Spring (S).	
Da W 4	10.27	11.30	Da W 40	13.15	12.14	12.65
Da W 17	12.10	11.60	Da W 43	13.10	12.30	12.80
Da W 17	12.10	12.60	Da W 44	12.90	12.30	12.60
Da W 19	11.75	12.30	Da W 45	13.14	11.60	12.37
Da W 20	11.04	11.40	Da W 46	12.91	12.30	12.61
Da W 24	11.00	9.00	Da W 47	10.99	8.30	9.65
Da W 24	11.00	14.00	Da W 48	14.28	12.30	13.29

In the table it will be noticed that all strains in the spring are approximately 1 per cent lower in dry-matter content than in the autumn. The results summarised in the table leave the question as to whether dry-matter content is governed by heritable or by environmental factors still undecided. So far, selection of roots of high and low dry-matter content respectively has produced strains of correspondingly high and low dry-matter content in one case only (Da W 24). Further work along these lines is therefore necessary. It has been

found that size of bulb is one factor affecting dry-matter content. In fact, unless the fresh weight of the roots is taken into account, selection for high dry-matter content amounts to little more than selection of the smallest roots. In future, accordingly, the fresh weight of each root sampled for dry-matter content will be taken into consideration.

Commercial Crop and Yield-Plot Test.

About $3\frac{1}{2}$ acres of Commercial Swedes (Darlington) were grown. About 1 acre of this area was devoted to a yield-plot test (one-half Darlington, one-half "Br" Half-Tankard Bronze Top) similar to that of the previous year.

II. Publications, Lectures, and Official Visits by Staff.

PUBLICATIONS (P) AND LECTURES (L).

Director :—

- 'The Formation of Herbaria of Crop Plants'—Imperial Botanic Conference, London, July 1924. (P)
- 'The Economic Possibilities of Plant Breeding'—Imperial Botanic Conference, London, July 1924. (P)
- 'Potato Breeding'—Conference on Potato Culture (Board of Agriculture for Scotland), Edinburgh, August 1924. (P)
- "Species from the Plant-Breeding Point of View"—Philosophical Society of Glasgow (Biological Section), February 1925. (L)
- "Self-Sterility and Cognate Problems"—Glasgow University Botanical Society, March 1925. (L)
- University of Edinburgh—Course of four Lectures on "Genetics applied to Crop Improvement." Delivered in the Agricultural Department, February and March 1925.

Director and Mr F. W. Sansome :—

- "The Improvement of Swedes and Turnips by Breeding"—Meeting of Association of Economic Biologists, Edinburgh, February 1925. (L)

Assistant Director :—

“Experiments on the Hybridisation of Oats”—Meeting of Association of Economic Biologists, Edinburgh, February 1925. (L)

Course of three Lectures on “Genetics applied to Crop Improvement,” delivered in the Agricultural Department, University of Edinburgh, February and March 1925.

Mr F. W. Sansome :—

“Transmission of Variegation by Grafting in *Aucuba Japonica*”—Botanical Society of Edinburgh, January 1925. (L) (Repeated to Natural History Society, Edinburgh, January 1925.)

Mr J. W. Gregor :—

‘The Breeding of a Leafy Perennial Rye-grass’—Scottish Farmer, October 1924. (P)

“Observations on the Physiology of Reproduction of Some Agricultural Grasses”—Meeting of Association of Economic Biologists, Edinburgh, February 1925. (L)

“Pollination and Fertilisation of Grasses”—Botanical Society of Edinburgh, March 1925. (L)

VISITS.

Director :—

Agricultural Research Council (Ministry of Agriculture and Fisheries), London, December 1924.

Conference on Patenting of Inventions (Ministry of Agriculture and Fisheries), London, January 1925.

Assistant Director :—

Potato Testing Station, Ormskirk, August 1924.

Mr J. W. Gregor :—

Craibstone Experimental Farm, October 1924.

The Director, Assistant Director, and Mr Gregor attended the Conference of the Scottish Agricultural Research Council in Glasgow in July 1924.

III. Demonstration and Exhibits.

Glasgow University Botanical Society visited the Station in June 1924; the Scottish Seed and Nursery Trade Association and a party of Swedish Agriculturists, led by Mr A. Riple, Swedish Consul, Newcastle-on-Tyne, paid a visit in July 1924.

The Society was represented at the British Empire Exhibition, Wembley, by an exhibit illustrating "The Improvement of Oats by Selection and Hybridisation" as carried out at the Station. The exhibit was housed in the Government building, and the costs were borne by the Ministry of Agriculture and Fisheries. An exhibit on similar lines and under the same conditions is being staged for the forthcoming Exhibition. There was also an exhibit illustrating the work of the Station at the Show of the Scottish National Fat Stock Club in December 1924.

IV. Acknowledgments.

Grateful acknowledgment is made to the undernoted departments, institutions, firms, and individuals for gifts of samples or other materials for experiment:—

Messrs Henry Alexander & Co., Nottingham Place, Edinburgh.

David Bell, Esq., J.P. (Messrs David Bell, Ltd.), Leith.

Messrs A. Cross & Sons, 19 Hope Street, Glasgow.

Director, Royal Botanic Gardens, Kew.

Director, Welsh Plant-Breeding Station, Aberystwyth.

Professor E. M. East, Bussey Institute, Mass., America.

James Elder, Esq. (Messrs Wm. Dods & Son), Haddington.

J. H. Elder, Esq. (Messrs Wm. Dods & Son), Haddington.

F. C. Engledow, Esq., School of Agriculture, Cambridge.

Messrs Gartons, Ltd., Seedsmen, Warrington.

Messrs Chas. Irvine & Son, Seedsmen, Jedburgh.

J. T. M'Laren, Esq., The Leuchold, Dalmeny.

A. T. M'Robert, Esq. (Messrs The Aberdeen Lime Co.),
Aberdeen.

National Institute of Agricultural Botany, Cambridge.

A. Nelson, Esq., B.Sc., Edinburgh.

Dr Peklo, Prag.

Regius Keeper, Royal Botanic Garden, Edinburgh.

W. Stuart, Esq., U.S. Department of Agriculture, Washington, U.S.A.

Mrs Wilson, St Andrews.

Thanks are also due to Messrs J. Lochrie, A. Broadfoot, R. Bain, C. H. Westwater, and Parker, who kindly gave their services as honorary members of the staff for varying periods, and whose assistance has been of the utmost value.

MONTAGU DRUMMOND,

Director of Research.