A REPORT TO THE HORTICULTURAL DEVELOPMENT COUNCIL
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BEETROOT: EVALUATION OF HYBRID VARIETIES 1992-93

FINAL REPORT

Project Number:	FV109
Project Title:	Beetroot: Evaluation of hybrid varieties
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Authentication

I declare that this work was done under my supervision according to the procedures described herein and that this report represents a true and accurate record of the results obtained.

Signature .....Vivian...Powell.....

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Project Leader

Date ...21.12.93.....

Report authorised by .....M.R. Bradley.....
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Relevance to Growers and Practical Application

Application

This project aimed to evaluate hybrid and monogerm red beet varieties, assessing growth and storage characteristics in comparison with a standard commercial variety.

The monogerm variety SG5002 produced 50% of its total yield in the 25-45 mm size grade. This size grade commands higher market prices but because of the high seed cost the high returns did not give an overall financial benefit.

The hybrid varieties Wodan and Action produced high total yields and these were reflected in higher returns and increased financial benefit for the crop.

The commercial (control) variety produced a lower yield in this trial but because of lower seed prices financial returns were higher than some of the higher yielding hybrid and monogerm varieties.

Summary

Objective

This project aimed to evaluate hybrid and monogerm varieties, assessing growth and storage characteristics in comparison with a standard commercial variety Crimson Globe.

Varieties

A	Crimson Globe (Control)	Elsoms	Control
B	Pablo	Elsoms	Hybrid
C	Wodan	Elsoms	Hybrid
D	Action	Elsoms	Hybrid
E	Red Ace	Bejo	Hybrid
G	SG5002	BrS	Monogerm
H	Moneta	Elsoms	Monogerm

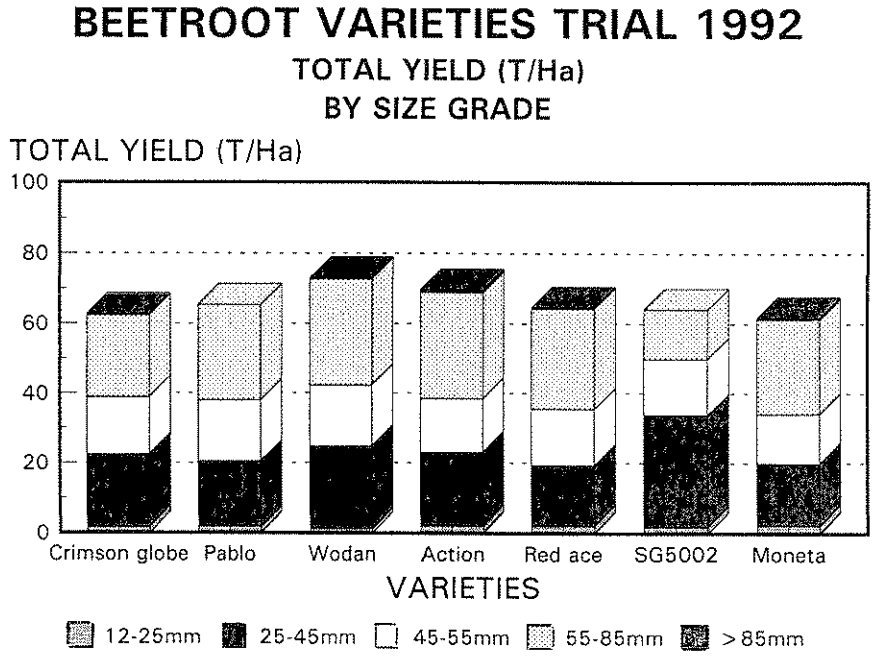
Results

1. The variety SG5002 produced a high yield of premium grade baby beet. Despite this, high seed costs reduced the overall financial benefit from this variety.

2. Total yields from the hybrid varieties Wodan and Action were significantly higher than the yield from the commercial control Crimson Globe.

3. Despite higher seed costs, increased yields and crop values led to a higher financial benefit for the varieties Wodan and Action.

4. The monogerm variety SG5002 produced less variable root shapes and more uniform measurements of diameter and depth of root.



Action points for growers

1. Where a high yield of baby beet is required the monogerm variety SG5002 could be used. The seed costs are however high and in this trial SG5002 did not store well.

2. The hybrid varieties Wodan and Action produced a high yield with the variety Wodan giving highest financial benefit of all the cultivars tested.

3. In this trial the cultivars Pablo, Red Ace and Moneta did not give any apparent benefit over the standard commercial variety Crimson Globe.

Introduction

Plant breeders have introduced hybrid varieties claiming that they have advantages over open pollinated varieties. The hybrid seed is expensive and there are concerns as to whether the extra cost is justified. New varieties require improved characteristics including uniformity of size and shape, good internal colour and good storage quality, which would enable growers to produce the crop more efficiently, and command a premium from processors. Preliminary results from a 1991 trial suggested that some hybrid beet varieties possess beneficial characteristics which may offset higher seed costs. In 1992 a trial was designed to substantiate these results using hybrid and monogerm varieties compared with a standard commercial variety, all grown using standard commercial seed densities and husbandry.

Objective

To evaluate hybrid and monogerm beet varieties, assessing growth, storage and processing characteristics in comparison with the standard commercial variety, Crimson Globe.

Materials and Methods

Site

HRI Stockbridge House, Cawood, Selby, North Yorkshire, YO8 0TZ.

Soil Type

Sandy loam of the Quorndon Series.

Varieties

A	Crimson Globe	Elsoms	Control
B	Pablo	Elsoms	Hybrid
C	Wodan	Elsoms	Hybrid
D	Action	Elsoms	Hybrid
E	Red Ace	Bejo	Hybrid
G	SG5002	BrS	Monogerm
H	Moneta	Elsoms	Monogerm

Crop Husbandry

The trial was drilled using a precision cone seeder drill (Oyjord). The target density was 215 plants/sq m (20/sq ft) as used in commercial practice. All subsequent husbandry was carried out according to best commercial practice.

Crop Diary

Base Dressing:	Sulphate of potash @ 200 kg/ha Solubor @ 11 kg/ha in 560 l water applied 18 May 1992
Sowing Date:	Trial drilled using Oyjord cone seeder drill 22 May 1992.
Herbicide:	Metamitron (as Goltix @ 5 kg/500 l water) applied 24 May 1992.
Pest & Disease Control:	Cypermethrin (as Ambush @ 250 ml/600 l water/ha) applied 17 June 1992. No fungicides applied.
Top Dressing:	180 kg/ha N applied 9 July 1992.

Harvest Date (crop into store): 28 September 1992.

First Storage Removal Date: 20 January 1993
Second Storage Removal Date: 22 April 1993

Trial Design

Randomised block with 4 replicates. Plots were 1.83 m x 7 m long with 4 rows at 40 cm blocks. Records at harvest were taken from 5.5 m lengths of the 2 centre rows.

Records

Germination:	Plants were assessed for rate of germination. 2 rows of 0.5 m.
Field Assessments:	Growth habit.
Harvest:	Records at harvest were taken from 5.5 m lengths of the 2 centre rows. Standard NIAB yield assessment, number and weight in the following sized grades: 12-25 mm, 25-45 mm, 45-55 mm, 55-85 mm and greater than 85 mm. 50 random roots/plot assessed for: Uniformity of diameter, depth, weight and shape. Colour score. Presence of white rings.
Storage:	2 assessment dates of mid January and mid April. 100 roots/plot assessed for presence of external disease symptoms.

Explanation of Statistical Terms

Throughout the main body of this report a number of statistical terms are referred to; these are:

SED = The standard error of the difference when comparing two means in that column of data.

A statistical term easier to interpret:

LSD 5% = The least (minimum) difference when comparing any two figures within a given column that is required for those figures to be statistically different.

N.S. = Not significant.

Variance = Variance is a measure of the spread of values for each variety. A large figure indicates a variable characteristic and a small figure a more uniform characteristic.

Results

Yield & Shape

Table 1: Yield (t/ha) in size grades.

Variety	25-45 mm	45-55 mm	55-85 mm	Total
Crimson Globe	20.8	16.5	23.5	62.6
Pablo	18.6	17.5	27.4	65.4
Wodan	23.5	17.5	30.6	73.0
Action	20.8	15.5	30.5	69.6
Red Ace	17.1	16.2	28.9	64.6
SG5002	31.9	16.2	14.2	64.1
Moneta	17.6	14.2	27.2	61.7
SED (27 df)	1.66	1.79	3.72	2.51
LSD (P=0.05)	3.4	NS	7.6	6.3

Total Yield: Wodan and Action produced a significantly higher yield than the control, Crimson Globe.

25-45 mm: SG5002 produced a significantly higher yield of small roots than the control, Crimson Globe. Red Ace produced a lower yield of small roots than the control.

45-55 mm: There were no significant differences in yield at this size grade.

55-85 mm: SG5002 produced a significantly lower yield of large roots than the control, Crimson Globe. Wodan and Action produced higher yields in this size grade, although differences were not statistically significant.

Table 2: Yield of roots in each size grade (as a percentage of total yield).

Variety	12-25 mm	25-45 mm	45-55 mm	55-85 mm	>85 mm
Crimson Globe	2.5	33.6	26.4	37.1	0.4
Pablo	2.8	28.6	27.0	41.6	0
Wodan	1.6	32.3	24.0	41.8	0.3
Action	3.0	30.0	22.3	43.7	1.0
Red Ace	3.3	26.6	25.2	44.6	0.3
SG5002	2.8	50.5	25.0	21.8	0
Moneta	3.8	28.5	23.1	44.0	0.7
SED (27 df)	0.60	3.60	2.76	4.78	0.63
LSD (P=0.05)	1.2	7.4	NS	9.8	1.3

The variety SG5002 was very uniform having 50% of the total yield in the 25-45 mm size grade.

Other varieties did not show any advantages in terms of uniformity of size grades.

Table 3: Variance of diameter and depth.

Variety	Variance of Diameter	Variance of Depth	Range of Shapes Score
Crimson Globe	5.05	4.90	2.75
Pablo	4.91	4.93	3.88
Wodan	5.07	5.17	3.13
Action	4.94	4.88	3.52
Red Ace	4.90	4.71	4.13
SG5002	4.71	4.44	2.65
Moneta	5.38	5.14	3.25
SED (27 df)	0.202	0.205	0.470
LSD (P=0.05)	NS	0.42	0.96

Variance is a measure of the spread of values for each variety, so a large figure indicates a variable characteristic and a small figure a more uniform characteristic.

There were no significant differences in measurements of diameter but SG5002 was the least variable. This variety was significantly more uniform in terms of depth of root, and also produced a lower range of shape scores which is an indication of increased uniformity.

Individual roots were assessed for shape. Shape scores used were; 1 oval, 2 round globe, 3 tankard, 4 plum, 5 wedge and 6 pointed. The varieties Crimson Globe, Wodan, Red Ace, SG5002 and Moneta produced a round globe shaped root, while Pablo and Action produced tankard shaped roots.

The variety Crimson Globe (control) produced a lower range of shape scores than the hybrid varieties but this difference was not statistically significant.

Storage Assessments

Table 4: Number of unmarketable roots showing external disease symptoms as a % of number into store (ang trans).

	Second Assessment (22.4.93)
Crimson Globe	12.4
Pablo	16.6
Wodan	19.4
Action	18.7
Red Ace	18.2
SG5002	22.6
Moneta	21.2
SED (55 df)	4.21
LSD (P=0.05)	8.4

Disease levels at the first removal date were very low and were not statistically analysed.

At the second removal date in April disease levels on the two monogerm varieties, SG5002 and Moneta, were significantly higher than the control Crimson Globe. At this assessment the control Crimson Globe showed lower disease levels than all of the hybrid varieties although these differences were not statistically significant.

Economic Appraisal

Table 5: Value of crop using yields as stated in Table 1 and commercial market prices.

Size Grade	25-45 mm	45-55 mm	55-85 mm	Total Value
Market Value £/tonne	£69	£50	£30	£/ha
Crimson Globe	1435	825	705	2965
Pablo	1283	875	822	2980
Wodan	1622	875	918	3415
Action	1435	775	915	3125
Red Ace	1180	810	867	2857
SG5002	2201	810	426	3437
Moneta	1214	710	816	2740

The monogerm variety SG5002 showed highest returns in the 25-45 mm size grade (baby beet) and overall total value.

The overall value of the hybrid variety Wodan was higher than other hybrid varieties and the control Crimson Globe. The value of the baby beet (25-45 mm) crop was also higher.

The lowest overall value was returned by the monogerm variety Moneta which reflects the higher yield of low value larger sized beet. (See Table 1).

Financial Benefit

Table 6: Calculated using values as stated in Table 5 and cost of seed/ha assuming a target density of 215 plants/m^2.

	Gross Return (£/ha)	Seed Cost (£/ha)	Financial Benefit (£/ha)
Crimson Globe	2965	314	2651
Pablo	2980	466	2514
Wodan	3415	445	2970
Action	3125	435	2690
Red Ace	2857	539	2318
SG5002*	3437	1113	2324
Moneta#	2740	1217	1523

* SG5002 was not commercially available until 1993, therefore the price quoted is as 1993.

\# Different seed size. Moneta M-P grade. All other varieties Q-S grade.

The variety Wodan gave a slightly higher financial benefit than all other varieties due to higher yield of baby beet and overall yield. Although the monogerm variety SG5002 produced a higher value crop the high cost of seed reduced the financial benefit considerably.

Varietal Characteristics

Crimson Globe (control)

Upright growth habit with large mid-dark green leaves. At harvest internal colour was good with few white rings. After storage disease levels were lower than hybrid and monogerm varieties.

Pablo

Upright and spreading growth habit with medium sized, pale coloured foliage. At harvest internal colour was good with few white rings.

Wodan

Upright growth habit with medium sized pale coloured foliage. At harvest this variety produced the highest total yield with good colour and few white rings.

Action

Upright growth habit with medium sized dark coloured foliage. Roots were slightly elongated. At harvest internal colour was good with few white rings.

Red Ace

Upright growth habit with dense pale coloured foliage. At harvest internal colour was good with few white rings.

SG5002

Spreading growth habit with mid green coloured foliage. Large number of small leaves near crown within main leaf canopy. At harvest a high percentage of total yield was in the 25-45 mm size grade. This variety produced a more uniform root shape. Disease levels after storage were higher than other varieties.

Moneta

Dense foliage with upright growth habit. Large mid green leaves. At harvest total yield tended to be lower than other varieties.

Discussion

There were no significant differences in rates of emergence for any of the varieties.

In the field no single variety was outstanding, many having upright growth habit and dense foliage which would facilitate top lifting.

At harvest the hybrid varieties Wodan and Action produced a higher total yield than other varieties, however, the yield within the 55-85 mm size grade was high and since this grade has a lower market value this increased yield did not increase overall value.

The monogerm variety SG5002 produced a high yield of baby beet with 50% of the total yield being produced in this size grade. As this grade commands a higher return, the overall value from this variety was higher than all other varieties. This variety produced less variable root shapes and more uniform measurements of diameter and depth of root.

It was unfortunate that in the 1992/93 season it was not possible to assess the processing qualities of these varieties because the local red beet processors were undergoing large scale renovations at this time.

Conclusions

1. The monogerm variety SG5002 produced a high yield of premium grade baby beet.

2. Total yields from the hybrid varieties Wodan and Action were significantly higher than the yield from the control Crimson Globe.

3. Despite higher seed costs, increased yields and crop values did lead to a higher financial benefit for the varieties Wodan and Action.

4. Because of the high cost of the monogerm seed the variety SG5002 produced a lower overall financial benefit despite the high value of the 25-45 mm size grade.