



SID 5 Research Project Final Report

defra

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- This form is in Word format and the boxes may be expanded or reduced, as appropriate.

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Project identification

1. Defra Project code	OF0304
2. Project title	Varieties of field vegetables and potatoes for organic production and marketing
3. Contractor organisation(s)	National Institute of Agricultural Botany Henry Doubleday Research Association
4. Total Defra project costs	£ 188,639.00
5. Project: start date	01 April 2001
end date	31 March 2004

6. It is Defra's intention to publish this form.

Please confirm your agreement to do so..... YES NO

- (a) When preparing SID 5s contractors should bear in mind that Defra intends that they be made public. They should be written in a clear and concise manner and represent a full account of the research project which someone not closely associated with the project can follow.

Defra recognises that in a small minority of cases there may be information, such as intellectual property or commercially confidential data, used in or generated by the research project, which should not be disclosed. In these cases, such information should be detailed in a separate annex (not to be published) so that the SID 5 can be placed in the public domain. Where it is impossible to complete the Final Report without including references to any sensitive or confidential data, the information should be included and section (b) completed. NB: only in exceptional circumstances will Defra expect contractors to give a "No" answer.

In all cases, reasons for withholding information must be fully in line with exemptions under the Environmental Information Regulations or the Freedom of Information Act 2000.

- (b) If you have answered NO, please explain why the Final report should not be released into public domain

Executive Summary

7. The executive summary must not exceed 2 sides in total of A4 and should be understandable to the intelligent non-scientist. It should cover the main objectives, methods and findings of the research, together with any other significant events and options for new work.

The objectives of the work were to investigate the suitability of selected varieties of vegetables and potatoes for organic production using organic or untreated seed on certified organic sites.

Organic growing of vegetables and potatoes imposes restrictions on the treatments which growers can apply to crops to maximise yield and maintain quality. Hence choice of variety is more critical in organic situations than for conventional crops where problems can be solved at a later date by application of pesticides or fertilisers. Varieties are needed that can respond to the sometimes sub optimum conditions that are imposed by the restrictions of organic systems and identification of these are not always evident from trials under conventional conditions.

In addition, variety choice may be restricted for organic growers as they are required to use organically produced seed of a variety where it is available. Derogation allows the use of untreated conventional seed where suitable varieties are not available organically.

This project tested:

- available organic seed as much of it has not been evaluated in any UK trials
- untreated seed of varieties in production for organic seed
- attempted to identify varieties of conventional seed that would be useful in organic systems so that organic seed can be produced.

In this 3 year period trials were carried out on leeks, cabbage, celery, broccoli, lettuce, cauliflowers, carrots and potatoes. Varieties were assessed for yield, quality, pest and disease resistance and shelf life and storage where appropriate. Seed health was also checked to ascertain levels of seed borne disease.

Results from these trials;

Leeks

Leeks were reasonably easy to grow organically. In our trials the main problems were weed control and leek rust infection although there is also the risk of thrip and White Tip infection. In some of the trials there was also an obvious nutrient shortage. A wide range of varieties is available differing in maturity, shank length disease resistance and winter-hardiness. In general the requirements of organic leek growers closely match those of conventional growers. Very few hybrids are available as organic seed.

Cabbage

2001 to 2003 trials included a wide range of types. As for other brassica crops aphid infestation and

speed of development were the most important factors in discriminating between varieties. In general smooth varieties were less affected than blistered varieties, early maturing varieties less affected than lates and red varieties less than green or white types.

Celery

Organic celery needs to be grown on water retaining soils and given adequate irrigation. just like the ICM crop. The biggest problem for the crop is *Septoria*, which can devastate plants very quickly. Starting with clean seed is essential but air-borne infection can come in from infected crops or debris. Giving plants better airflow from wider spacings or bed systems seems to delay infection. Slugs can also cause problems and data on both these problems was recorded and included in the published results.

Broccoli

Growing organic broccoli trials presented similar pest problems to other brassica crops in that cabbage root fly has to be avoided at establishment and aphid and caterpillar attacks later on. Fleece was used on all early trials but in later years it was not used to allow for easier weed control. Broccoli was fairly competitive with weeds and some recent trials were only hand weeded once. Fertility seems to be a problem and we did not achieve heavy crown weights.

Lettuce

A wide range of types of lettuce are important for organic growers and this series of trials included butterhead, crisphead, Batavian, Cos, Little Gem and leaf types. Vigour, flavour, disease, pest and tipburn resistance are all important characters for a successful organic variety. Fortunately there are more genetic pest and disease differences available in lettuce than for most other vegetable crops. In addition a large number of varieties are available as organic seed.

Cauliflower

Three maturity periods were sampled i.e. summer, late autumn and Spring Heading. Aphid and caterpillar damage were major problems and there was some evidence of varietal differences in susceptibility. When conventional trials with similar varieties were grown from the same planting dates the organic varieties were slower to mature. This may have been because nitrogen was more limited. Very few varieties of cauliflower are offered as organic seed and growers would struggle to find a good continuity program.

Carrots

The 2001 to 2003 trials concentrated on main crop varieties. A successful organic carrot variety needs most of the following: good early vigour to emerge quickly and compete with weeds, rapid bulking to compensate if late sowing is used to avoid first generation carrot fly, large top for weed suppression and any pest or disease resistance available. Several mainly hybrid varieties performed very well in these trials.

Potatoes

Good seed quality is a fundamental in the production of a quality crop. Chitted seed will encourage rapid emergence and aid in better weed control and earlier bulking leading to bolder tuber samples. Variety selection should be made for rapid establishment, good ground cover, early bulking yield potential and a good resistance to pests and diseases, especially late blight. Sharpo Axona and Sharpo Mira had outstanding blight resistance.

Shelf Life

Shelf life depended on the health of produce tested. If healthy clean material was tested results were similar to those of conventional vegetables. If there was disease or pest damage at the beginning of a shelf life test then produce tended to deteriorate more quickly.

Seed Health

Seed borne disease levels were checked by the OSTs. In general brassicas were reasonably clean but some carrot and celery seed lots had high levels of *Alternaria* or *Septoria* infection.

All trials were reported as NIAB One year results and also made available on the COSI web site: www.COSI.org In addition, data for over 400 varieties was summarised and published in the NIAB Organic Vegetable Handbook.

Project Report to Defra

8. As a guide this report should be no longer than 20 sides of A4. This report is to provide Defra with details of the outputs of the research project for internal purposes; to meet the terms of the contract; and to allow Defra to publish details of the outputs to meet Environmental Information Regulation or Freedom of Information obligations. This short report to Defra does not preclude contractors from also seeking to publish a full, formal scientific report/paper in an appropriate scientific or other

journal/publication. Indeed, Defra actively encourages such publications as part of the contract terms. The report to Defra should include:

- the scientific objectives as set out in the contract;
- the extent to which the objectives set out in the contract have been met;
- details of methods used and the results obtained, including statistical analysis (if appropriate);
- a discussion of the results and their reliability;
- the main implications of the findings;
- possible future work; and
- any action resulting from the research (e.g. IP, Knowledge Transfer).

Scientific objectives

1. *Carry out trials with selected varieties and crops under organic growing conditions in order to produce information and advice on the most appropriate variety choice for high quality production and marketing. Recordings will be made of suitability of produce for both the retail supermarket and the box scheme markets. All trials will be carried out on UKROFS approved sites and all seed raising will be carried out using approved organic techniques. Where possible, organic seed will be included for comparison with other seed.*

16 trials were carried out each year, 2 for each listed crop with over 120 varieties screened each year. A Steering group made up of all sectors of the organic industry including growers, advisors, seed companies, certification authorities and retailers provided advice on choice of sites, selection of entries, growing methods, grading and recording criteria. All trials were grown on organically approved sites. Organic seed was used whenever possible.

2. *Prepare individual trial and crop one-year results presenting records taken with a summary of variety performance.*

All trials were recorded and data summarised in NIAB one-year results. 10 results were prepared each year (2 for each of cabbage and cauliflowers as there were trials for 2 maturity types). These were posted to NIAB members and made available to everyone on the COSI web site.

3. *Prepare over years summary information and advisory guidelines for organic production with the crops studied, including strategies for disease control and avoidance.*

Over years summary information was prepared and published in the NIAB Organic Vegetable Handbook. This is revised every 2 years. Information was also disseminated through press articles and an annual conference held at HDRA which consistently attracts an attendance of 100.

4. *The research will assist in reducing the uncertainty of organic production by identifying varieties and strategies that will provide a greater possibility of achieving suitable harvested crops. The demands of the market are such that quality in terms of shape, uniformity, freedom from blemishes and damage as well as timeliness are all essential factors that have to be addressed. If organic produce is to have a wider appeal to general consumers it must satisfy the critical demands of those customers, in terms of quality, within the constraints of organic standards.*

All trials were assessed against protocols developed in partnership with all sides of the organic business. Information was collected on a large number of varieties available as organic or untreated seed and a small number of varieties available as conventional seed which would be useful additions to the organic range.

The extent to which the objectives were met

The trials were very successful and met the objectives of the trials

Methods used

All trials were grown to organic certified standards on host organic farms. Trials were normally surrounded by commercial organic production and treated in the same way. All inputs met organic standards.

Reliability of results

Results accurately represent the performance of the varieties in the trials and could be extrapolated to growers own holdings by reference to control varieties.

Main implications of the findings

These differ for each crop tested the most important are:

Leeks

- early vigour is important for efficient weed control
- hybrids less dominant than for conventional crops and are less available (1 at the time)
- rust, white tip and thrips are the worst P&D problems
- nutrition is an issue for late crop
- organic seed is available for a reasonable number of open pollinated varieties.

Cabbage

- aphid was the main problem
- early quick growing varieties are less exposed
- blistered varieties are hard to keep clean
- red varieties performed well organically
- organic seed was moderately available

Celery

- Septoria* is the main disease problem
- slugs are the worst pest problem
- seed borne disease was common
- only 3 varieties were available with organic seed
- continuity can be difficult especially in the autumn

Broccoli

- summer and autumn crops were successful.
- aphid can be a problem with fleecing an option
- Marathon can be out performed by other varieties.
- achieving supermarket crown weights can be difficult
- organic seed was mainly available for poorly performing open pollinated varieties
- hybrids were not widely available.

Lettuce

- most types possible
- Iceberg weights not always easy to achieve
- Bremia, aphid & tipburn were the main problems
- continuity in the autumn can be difficult due to Bremia
- organic seed is available for 154 varieties

Cauliflower

- aphid and caterpillar damage were the main pest problems
- maturities were slower than in conventional trials
- coloured curd varieties performed well
- there is a shortage of good quality varieties available as organic seed

Carrots

- Carrot Fly is the main problem
- hybrids consistently best for top yields and vigour
- top size is relevant for both weed suppression and disease build up.
- nutrient claims were investigated but difficult to substantiate.
- seed borne disease can be a problem
- organic seed was available for 29 varieties but most were not widely used conventionally.

Potatoes

- Blight was the main production problem and varieties differ in resistance
- Virus diseases spread by aphids can build up on organic crops
- Black leg below EU certification levels can build up to dangerous levels in organic crops
- A good range of organic seed is available but popular varieties can run out making continuity programs difficult.

Shelf life

- tested in ambient and refrigerated conditions
- there were varietal differences in most crops especially between types of lettuce
- length of shelf life was related to the health of produce at the beginning of the test

Possible future work

New varieties are constantly becoming available as organic seed which need evaluation. In the current project OF0346 taste panel evaluation is included and needs more data to build up a meaningful database.

Grower "Participation trialling" has also been successfully introduced but only for 2 crops a year so there is considerable scope for building on this.

■ **References to published material** ---

9. This section should be used to record links (hypertext links where possible) or references to other published material generated by, or relating to this project.

Published material

NIAB One year results

Organic Leeks 2000/2001, 2001/2002, 2002/2003

Organic Summer & Autumn Cabbage 2001, 2002, 2003

Organic Winter Cabbage 2001/2002, 2002/2003, 2003/2004

Organic Celery 2001, 2002, 2003

Organic Broccoli 2001, 2002, 2003

Organic Lettuce 2001, 2002, 2003

Organic Summer Cauliflowers 2003

Organic Autumn Cauliflowers 2001

Organic Spring Heading Cauliflowers 2001/2002, 2002/2003, 2003/2004

Organic Carrots 2001, 2002, 2003

Organic Potatoes 2001, 2002, 2003

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