

Project title: Narcissus: Screening new varieties for basal rot susceptibility

Project number: BOF 57

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Report: Annual report, Autumn 2006

Previous reports: None

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Project commenced: June 2005

Expected Completion date: Autumn 2009

Key words: daffodils, varieties, cultivars, basal rot, *Fusarium oxysporum f. sp. narcissi*

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The results and conclusions in this report are based on a series of experiments conducted over a one-year period. The conditions under which the experiments were carried out and the results have been reported in detail and with accuracy. However, because of the biological nature of the work it must be borne in mind that different circumstances and conditions could produce different results. Therefore, care must be taken with interpretation of the results, especially if they are used as the basis for commercial product recommendations.

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## **GROWER SUMMARY**

### **Headline**

- 50 bulb stocks were screened under high basal rot disease pressure in 2006. Twelve of these, in initial studies, had infection levels of >30%, the remaining 38 had infection levels of 0 to 27%.

### **Background and expected deliverables**

During 2005/06 fifty daffodil bulb stocks, including many still unnamed, have undergone a basal rot susceptibility test at Trenoweth Horticultural Centre, St. Mary's, Isles of Scilly. The simple screening test for basal rot, established by Rosewarne between 1980 and 1989, involves planting a healthy test bulb beside a basal rot infested bulb cv. 'Golden Harvest'.

### **Summary of the project and main conclusions**

This severe disease pressure (equivalent to planting a stock with 50% rotten bulbs) has revealed susceptibility differences ranging from 0% to 80% in stocks in the first year. The stocks with greater than 30% infection were Dutch Master, Brabazon, Red Devon, Loch Owskeich, Golden Ducat, CABGA 24, CABGA 43, CABGA 49, CABGA 52 and CABGA 55. Two stocks: CABGA 40 and CABGA 41, were discarded prior to planting the trial due to high basal rot infection levels. Stocks with 0% infection were Rosemoor Gold, CABGA 65/45/2, ST. KEVERNE, Talwyn, St. Peter, CABGA 37, CABGA 19, Kerensa, Cornish Chuckles, Chinita, Beauvallon

### **Financial benefits**

These first year results will need to be confirmed by further work but as this progresses growers will be able to eliminate susceptible varieties and the industry will benefit as a whole by being able to give priority treatment and propagation to the most tolerant or resistant basal rot stocks.

### **Action points for growers**

- Growers with daffodil stocks of Dutch Master, Brabazon, Red Devon, Loch Owskeich, Golden Ducat, CABGA 24, CABGA 40, CABGA 41 CABGA 43, CABGA 49, CABGA 52 and CABGA 55 should carefully consider strategies for basal rot management before planting further stocks.

# SCIENCE SECTION

## Introduction

Basal rot (*Fusarium oxysporum* f. sp. *narcissi*) is the most serious bulb-borne fungal disease of narcissus worldwide. The fungus causes root rot, premature leaf senescence and on lifting, bulbs feel soft and may be completely rotted. Basal rot has been damaging daffodil crops for at least 100 years and remains one of the most intransigent problems with virtually all growers suffering losses and uncertainty every year. The disease causes huge problems in the bulb trade, especially exports, and its presence in consignments reflects badly on the industry. For many years the two major varieties 'Golden Harvest' and 'Carlton', together with many others, have recorded varying, but significant, Basal rot losses and have had to be routinely treated with fungicides. The replacement of these varieties with resistant stocks is long overdue.

Daffodil breeding at Rosewarne Experimental Horticulture Station has created a large pool of new varieties that have not been screened for basal rot susceptibility as part of the assessment programme. The parent lines used by Rosewarne offer good possibilities of resistance but clones selected in the latter years of the programme need to be tested.

The aim of the project is to give growers data on the susceptibility of these new clones to basal rot. The project will use a testing system, which has already been successfully applied to a range of Rosewarne raised clones, and existing commercial cultivars. To date, no reliable laboratory screening technique has been developed. The field test consists of planting healthy bulbs of each stock next to inoculator bulbs (*Fusarium*-rotted 'Golden Harvest' bulbs) and assesses the test varieties for Basal rot losses over one or two years.

## Materials and Methods

### Trial design and bulb stocks

A healthy test bulb of each stock was planted next to a rotted 'Golden Harvest' bulb in which the presence of *Fusarium* has been confirmed.

50 different stocks of narcissus were tested for basal rot susceptibility in 2006. The bulbs were supplied by growers, who provided 50 bulbs per stock. The bulbs had not been treated with a fungicide dip in the past two years; and each of the different varieties were named or identified under a code number.

Each selection was exposed to a high level of *Fusarium* inoculum over one and two growing seasons.

### Production of infected bulbs

'Golden Harvest' bulbs were artificially infected with *Fusarium oxysporum* f. sp. *narcissi* by cutting the base plate of a bulb, immersing it in an infected dip and then storing the bulbs at 25°C for up to 4 weeks to allow symptoms to develop. Only those inoculators showing clear symptoms of basal rot infection of softness and whitish *Fusarium* sporulation around the base plate were used.

### Planting and layout of the trial

In September 2005, the healthy test bulbs of each stock were planted by hand and ridged up as per standard bulb production. The test bulbs were planted in double rows, 10 cm apart from each other. An inoculator bulb was then planted in tubular netting next to each test bulb. In order to not lose any bulbs, the test bulbs were planted in a net bag so their presence or absence could be recorded on lifting in June 2006.

For each variety, two blocks of ten bulbs were planted adjacent to each other. Therefore for each variety:

- The one-year test comprised 2 replicates x 10 bulbs per plot
- The two-year test comprised 2 replicates x 10 bulbs per plot

Thus, over a 4-year period each stock will be subjected to 4 x one-year tests and 2 x two-year tests. This will provide 12 sets of data over 4 years. There will be 10 spare bulbs per stock.

In all respects the cultivation of the trials followed standard bulb production management.

### Assessment of the trial

In June 2006, after one growing seasons the bulbs from each plot of the one year down trial were lifted, and stored at ambient temperature for one month. A visual assessment for the presence of basal rot was then made. Assessment of infection was made by; not infected = bulb has survived and perhaps increased in weight or infected = bulb rotted.

The bulbs that were not infected with basal rot were replanted in September 2006 for reassessment in July 2007. Where stocks had insufficient survivors, the spares (originally 10) were used, but after these were depleted, the stock was scored as susceptible and removed from the trial.

### Analysis of results

The results were recorded as the number of rotted bulbs and the number of firm bulbs remaining. The latter figure sometimes increased due to natural division. The weight of firm bulbs relative to their planted weight was recorded. This is normally inversely related to disease attack.

In this interim report the results provide guidance for future policy in developing the stocks and full statistical analysis of the results will be presented in the final report.

## Results

### One year-down plots 2005-6

Daffodil bulb stock	Number of bulbs lifted in 2006 from 20 bulbs planted	No. of basal rot infected bulbs	% of bulbs infected with basal rot	Final weight of healthy bulbs as a % of planted weight #
Rosemoor Gold	37	0	0	208
CABGA 65/45/2	35	0	0	182
ST. KEVERNE*	34	0	0	161
Talwyn	41	0	0	159
St. Peter	34	0	0	148
CABGA 37	45	0	0	147
Cornish Pride (CABGA 19)	26	0	0	147
Kerensa	22	0	0	122
Cornish Chuckles	21	0	0	122
Chinita	26	0	0	114
Beauvallon	50	0	0	88
Tamara	41	1	2	116
CABGA 8	38	1	3	175
CABGA 22	29	1	3	140
Veryan	33	1	3	136
Golden Anniversary	29	1	3	136
CABGA 50	38	1	3	111
CABGA 39	39	1	3	106
Lancaster	24	1	4	120
Trelawney Gold	28	1	4	110
Jersey Roundabout	23	1	4	95
Jedna	37	2	5	204
Kingscourt	35	2	6	121
Tibet	32	2	6	104
CABGA 48	43	3	7	124
Gold Crest	39	3	8	120
Jersey Torch	25	2	8	94
Emblyn	43	4	9	173
Dellan	45	4	9	117
CABGA 47	39	4	10	94
CABGA 38	24	3	13	153
CABGA 20	42	6	14	86
Gold Crown	47	7	15	147
Irish Minstrel	37	6	16	100
CABGA 21	51	9	18	92
STANDARD VALUE	27	5	19	90
Knight of St. John	23	5	22	153
Marjorie Hine	26	7	27	153
DUTCH MASTER	29	10	34	127
Brabazon	62	21	34	125
CABGA 24	35	12	34	78
RED DEVON	20	7	35	96
Loch Owskeich	28	12	43	61
GOLDEN DUCAT	34	15	44	88

CABGA 49	30	15	50	71
CABGA 55	42	21	50	42
CABGA 52	29	19	66	50
CABGA 43	33	27	82	19

\* Varieties in bold represent those commonly grown in the UK

# (200% = double planted weight recovered, 100% = planted weight recovered, 50% = half of the planted weight recovered)

Two stocks (CABGA 40 and CABGA 41) were received for planting in September 2005, however they were discarded prior to planting due to very high levels of basal rot in the material received.

## Discussion

The project is due to run until 2009 by which time there will be 4 sets of 1-year-down data and 2 sets of 2-year-down data. The above are therefore preliminary results which will need to be confirmed in further tests over different seasons before action is taken to destroy disease susceptible stocks.

Between 1980 and 1989 the project leader applied the same screening test to a wide range of varieties and un-named seedlings raised at Rosewarne. This new data can, in some cases, be placed alongside the former records as a means of adding confidence to the figures.

A selection of these comparative data does show that there appear to be no seriously erratic or unwelcome differences bearing in mind that the test is applied to just 20 bulbs. For example:

Variety (CABGA No)	% basal rot infection	
	1980-1989	2006
GOLDEN DUCAT	59	44
DUTCH MASTER	31	34
RED DEVON	19	35
Talwyn	18	0
Golden Anniversary (1)	16	3
Cornish Pride (19)	13	0
Emblyn	12	9
Patrick Hackett (8)	11	3
Dellan	8	9
Tamara	5	2
Jedna	4	5
ST. KEVERNE	0	0
Kerensa	0	0
Rosemoor Gold (46)	0	0
Cornish Chuckles (80)	0	0

The tests conducted in 1980-89 sought to avoid the release and distribution of new seedlings which would prove susceptible to disease in commerce. The threshold was set at that of Dutch Master a variety that is slightly to moderately prone to disease. In the tests over 9 seasons it averaged 31%. Compared with Golden Harvest and Carlton at 83 and 85 % respectively.

It is proposed to apply the same controls in these experiments as a means of identifying the stocks of high susceptibility to basal rot. On the basis of this first-year result the following stocks will need to be carefully observed in commercial production.

<b>Highly likely to be troublesome*</b>	<b>Likely to be troublesome</b>
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<b>Stock</b>	<b>% basal rot infection</b>	<b>Stock</b>	<b>% basal rot infection</b>
CABGA 43	82	CABGA 24	34
CABGA 52	66	Loch Owskeich	43
CABGA 55	50	Brabazon	34
CABGA 49	50		

\* CABGA stocks 40 and 41 were omitted from this trial due to severe basal rot in the bulbs supplied.

A further 64 bulbs stocks were submitted for basal rot screening in 2006, therefore a total of 112 stocks will be tested during 2006/07.

## **Technology Transfer**

A preliminary report was published in HDC News in October 2006

An outline of the work was presented at the Bulb Growers' Seminar at Rosewarne on the 16 November 2006.