

<b>Project title</b>	Susceptibility of 42 apple varieties to pests and diseases
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**Authentication**

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

..... J V Cross  
Signature

Date .....

## CONTENTS

	Page
<b><u>Grower Summary</u></b>	<b>1</b>
<b><u>Science section</u></b>	<b>4</b>
Objectives	4
Methods	4
Results & Discussion	4
Acknowledgements	7
References	7

## **Grower Summary**

The field experiment at Poultry Farm, Marden to evaluate the susceptibility of 42 apple varieties (four replicate plots of two trees per variety, M9 rootstock) to pests and diseases to determine their suitability for organic production in the UK, was continued for a fifth season. No foliar sprays were applied. Pests and diseases and their damage were assessed in July 2002 and on a sample of 50 leaves per variety taken in October 2002. Crop load (number of fruit present per tree) and crop growth were also assessed. The incidence of scab, mildew, leaf spot and rosy apple aphid and the average number of fruits which matured per tree in 2002 are summarised in Table 1.

### **Scab:**

Results of five years of assessments have indicated the following classification of scab susceptibility:

#### Varieties of low or very low susceptibility to scab:

A567/19, A931/15, A93/16, Antonoulka, Delorina, Discovery, E11/20 (released as Park Farm Pippin), Early Victoria, Edward VII, Florina, Freedom, Goldrush, Judeline, King of the Pippins, Lord Lambourne, Mother, Prima, Princess, Priscilla, Red Fortune, Redfree, Saturn, Sir Prize, Vanda, Wyken Pippin.

#### Varieties of high susceptibility to scab:

E210/198, Egremont Russet, Fiesta, Greensleeves, Northern Greening, Regent, Winston Red Sport.

#### Conclusion/recommendation:

Scab is the most important disease and one of the main limiting factors in organic apple production. Choosing varieties of very low or low susceptibility to scab and avoiding susceptible varieties is important to successful production without heavy reliance on copper and sulphur sprays. The varieties of low or very low susceptibility to scab are suitable for organic production from this point of view. The varieties of high susceptibility are unsuitable.

### **Mildew:**

Taking all five years assessments, the following classification of mildew susceptibility has been derived:

#### Varieties of high susceptibility to mildew:

A567/19, Ceeval, Delorina, E83/4, Freedom, Goldrush, King of Pippins, Northern Greening, Princess, Priscilla, Sir Prize, Vanda and Wyken Pippin.

Varieties of low or very low susceptibility to mildew:

Discovery, E11/20 (now Park Farm Pippin), Early Victoria, Edward VII, Falstaff, Florina, Greensleeves, Herrings Pippin, Judeline, Lord Lambourne, Prima, Red Ellison, Red Fortune, Redfree, Saturn, Wealthy.

Conclusion/recommendation:

Mildew is an important disease in organic apple production, though control can be achieved in areas of low to moderate risk by removal of primaries coupled with sulphur spray programmes. Avoiding susceptible varieties of high susceptibility to mildew is important to successful production. The varieties of high susceptibility should be avoided if possible.

**Leaf spot:**

Fungal leaf spots (apparently caused by *Phoma* sp.) are minor diseases in conventional apple production as they are controlled by fungicide sprays for scab and mildew. In organic apple production they are more important because they are not controlled adequately by sulphur or copper sprays applied for scab or mildew control. The varieties E11/20 (now Park Farm Pippin), Early Victoria, Falstaff, Northern Greening and Winston Red Sport had a high incidence of leaf spot in 2002. Mother, Northern Greening and Winston Red Sport have proved consistently susceptible to leaf spot over the five years. Infection was found also on the fruits on the variety Falstaff, a potential problem with organic production of this variety. Infection on the fruits of Early Victoria has occurred at high levels in previous years.

**Rosy apple aphid:**

Varieties of high susceptibility to rosy apple aphid identified to date are Boscoop, Discovery, Egremont Russet, Greensleeves, Northern Greening and Vanda. No rosy apple aphid has been found on Goldrush in any of the five years. This does not mean it is necessarily completely resistant as infestation by the pest is sporadic and patchy. It might have escaped infestation partly (or wholly) through random chance.

**Crop load:**

Over the four year cropping period to date the varieties Judeline and Prima have had by far the highest total crop load, bearing a total of well over 200 apples per tree. Falstaff, Greensleeves and Priscilla have also cropped well with a total of over 150 fruits per tree. Antonoulka, Edward VII, Mother and Northern Greening have cropped poorly, bearing a total of less than 50 fruits per tree over the 4 year cropping period.

**Table 1. Mean scores (0= none, 5=severe) for scab severity, mean number of primary mildew infections per tree, mean scores for secondary mildew and leaf spot severity, presence (+) or absence (0) rosy apple aphid and mean number of fruits per tree in the 2002 season**

Variety	Leaf scab sore June	Fruit scab score June	Leaf scab sore October	No. 1° mildew/ tree June	2° mildew score June	Leaf spot score June	Rosy apple aphid June	Crop load (fruit /tree)
A567/19	0.0	0.0	0	12.4	3.0	1.0	+	16
A931/15 (Meridian)	0.6	1.0	1	3.8	2.9	1.5	0	20
A93/16	1.0	1.0	1	4.6	2.4	1.4	0	20
Antonoulka	0.0	0.0	0	0.0	2.5	1.4	+	7
Boscoop	1.9	1.9	1	2.4	2.0	2.3	+	30
Ceeval	0.3	1.1	2	5.3	2.0	1.0	+	21
Delorina	0.0	0.0	1	18.3	4.2	1.5	0	15
Discovery	0.0	0.0	1	0.0	1.0	1.0	+	21
D R.Wealthy	0.8	1.6	1	0.6	2.4	1.6	0	17
E11/20	0.0	0.0	0	0.8	0.1	2.5	+	43
E83/4	1.9	1.5	3	8.8	3.0	1.5	+	37
E210/198	4.0	2.9	3	2.4	2.0	1.4	+	28
Early Victoria	0.0	0.0	1	0.3	1.3	2.9	+	14
Edward VII	0.0	0.0	0	5.6	1.5	1.4	0	16
Egremont Russet	1.9	1.1	2	9.6	2.4	2.1	0	40
Falstaff	1.4	1.1	1	0.8	1.3	3.4	+	41
Fiesta	2.8	2.3	3	2.9	2.5	1.8	+	19
Florina	0.0	0.0	0	0.5	1.4	1.0	+	35
Freedom	0.0	0.0	0	25.8	2.3	1.3	0	27
Goldrush	0.0	0.0	0	4.1	5.0	0.6	0	59
Greensleeves	3.1	3.4	2	4.8	2.3	0.8	+	27
Herrings Pippin	0.3	0.0	1	1.0	1.9	0.5	+	39
Judeline	0.0	0.0	0	0.3	2.6	2.3	+	48
King of Pippins	0.0	0.0	2	23.0	3.6	0.4	+	33
Liberty	0.0	0.0	1	4.8	2.9	2.4	0	73
Lord Lambourne	0.9	0.3	1	0.1	0.8	0.9	+	33
Mother	0.8	1.1	0	3.8	2.6	2.4	+	23
N. Greening	2.1	1.5	3	5.1	3.0	3.4	+	12
Prima	0.0	0.0	0	0.4	1.0	1.1	+	58
Princess	0.5	0.8	0	24.6	3.0	0.9	0	25
Priscilla	0.4	0.4	0	2.4	2.9	1.3	+	46
Red Charles Ross	1.9	0.3	0	0.7	1.9	1.0	+	20
Red Ellison	0.0	0.0	1	0.3	1.0	1.1	0	9
Red Fortune	0.0	0.0	0	0.1	2.1	1.5	+	18
Redfree	0.0	0.0	0	1.6	1.4	2.0	0	38
Regent	4.0	4.4	2	0.0	1.6	1.9	0	33
Saturn	0.0	0.0	0	7.0	1.9	2.0	0	16
Sir Prize	0.0	0.0	1	4.1	4.0	1.3	0	29
Vanda	0.0	0.0	0	1.9	1.7	1.1	+	35
Wealthy	0.5	1.4	1	0.3	1.8	2.3	+	18
Winston R S	2.8	2.7	2	6.6	2.4	3.4	+	20
Wyken Pippin	0.0	0.0	2	19.7	3.3	1.5	+	5

## **Science Section**

### **Objectives**

The aim of this work is to determine the susceptibility of 42 apple cultivars to pests and diseases in order to identify varieties that are suitable for organic apple production in the UK. The results of the first 3 years assessments are reported by Cross & Berrie (2000) and of the fourth year (2001) by Cross & Berrie (2002). These reports are available from the HDC office.

### **Methods**

The experimental plot containing four replicate two tree plots of each of 42 apple cultivars was planted at Poultry Farm, Marden in February 1998 (by kind permission of Mr Peter Hall) (Cross & Berrie, 2000). No foliar sprays have been applied. The incidence of pests and diseases on each plot has been scored in June-July and in September – October each year by J V Cross (Entomologist) and A M Berrie (Plant Pathologist) from HRI-East Malling. Each year, a report of work has been produced for the APRC and on 14 November 2000, an overall report of the first three years was issued. In 2002, assessments were done in the orchard on 16-19 July. Secondary mildew, leaf scab, fruitlet scab, leaf spot on leaves and fruitlets and rosy apple aphid infestation were scored on a 0-5 severity scale (0 = none .... 5 = severely infested/infected). The primary mildew infections and the number of fruits on each tree were counted. For the late season assessment, in order to gain data on late season leaf infection by scab and pests, a sample of 12 leaves was taken from each plot in early October 2002. The severity of scab and leaf spot on each leaf was scored on a 0-5 scale. The percentages of leaves infested with each of the main species of leafminer that occur on apple were also assessed on the following scale: 0=0, 1=1-20, 2=21-40, 3=41-60, 4=61-80, 5=81-100. The mean counts and scores for each variety were calculated for each assessment date and the relative susceptibility of the varieties to scab and mildew and to aphids was categorised.

### **Results & Discussion**

The mean scores and counts are given in Table 2 (first assessment, July 2002) and Table 3 (October 2002 leaf assessment). Table 4 gives the mean numbers of fruits per tree in each year from 1999 (the first cropping year) to 2002 and the mean total number of fruits per tree.

### **Scab:**

Numerous scab infection periods occurred in mid-March around about bud-burst in 2002. This was followed by a dry spell which lasted until the last week in April. Thereafter, the weather was very wet and there were numerous scab periods throughout late April, May and June. Thus overall, the scab risk was high in 2002. However, no scab was found on the fruits or leaves of A567/19, Antonoulka, E11/20 (now Park Farm Pippin), Edward VII, Florina, Freedom, Goldrush, Judeline, Prima, Red Fortune, Redfree, Saturn or Vanda. Of these, Antonoulka, Freedom, Prima, Redfree, Saturn and Vanda had been given a 'very low or absent' scab rating in the previous 4 years of the trial. The other varieties had been given an overall low scab rating. In June 2002, low levels of scab were found on the leaves and fruits of Mother, a variety that had received an overall very low or absent scab rating in previous years. High levels of scab on E210/198, Fiesta, Greensleeves, Northern Greening, Regent and Winston Red Sport were entirely consistent with the high susceptibility to scab rating of the previous 4 years.

Examining the results of the scab assessments over all 5 years, the following varieties have been found to be of low or very low scab susceptibility and are thus, from the scab susceptibility point of view, suitable for organic production:

#### *Varieties of low or very low susceptibility to scab:*

A567/19, A931/15, A93/16, Antonoulka, Delorian, Discovery, E11/20 (now Park Farm Pippin), Early Victoria, Edward VII, Florina, Freedom, Goldrush, Judeline, King of the Pippins, Lord Lambourne, Mother, Prima, Princess, Priscilla, Red Fortune, Redfree, Saturn, Sir Prize, Vanda, Wyken Pippin.

#### *Varieties of high susceptibility to scab:*

E210/198, Egremont Russet, Fiesta, Greensleeves, Northern Greening, Regent, Winston Red Sport.

#### *Conclusion/recommendation:*

Scab is the most important disease and one of the main limiting factors in organic apple production. Choosing varieties of very low or low susceptibility to scab and avoiding susceptible varieties is important to successful production without heavy reliance on copper and sulphur sprays. The varieties of low or very low susceptibility to scab are suitable for organic production from this point of view. The varieties of high susceptibility are unsuitable.

### **Mildew:**

High numbers of primary mildew infections were found on A567/19, Delorina, E83/4, Egremont Russet, Freedom, King of Pippins, Princess and Wyken Pippin. Higher levels (mean score > 2.5) of secondary mildew were found on A567/19, A931/15 (Meridian), Delorina, E83/4, Goldrush (very severe), Judeline, King of Pippins, Liberty, Mother, Northern Greening, Princess, Priscilla, Sir Prize and Wyken Pippin. These ratings were consistent with the previous 4 years with the exception of Judeline, which had previously



been scored of low susceptibility to mildew. Taking all five years assessments, the following varieties have been found to be consistently of high susceptibility to mildew:

*Varieties of high susceptibility to mildew:*

A567/19, Ceeval, Delorina, E83/4, Freedom, Goldrush, King of Pippins, Northern Greening, Princess, Priscilla, Sir Prize, Vanda and Wyken Pippin.

*Conclusion/recommendation:*

Mildew is an important disease in organic apple production, though control can be achieved in areas of low to moderate risk by removal of primaries coupled with sulphur spray programmes. Avoiding susceptible varieties of high susceptibility to mildew is important to successful production. The varieties of high susceptibility should be avoided if possible.

**Leaf spot:**

Fungal leaf spots (apparently caused by *Phoma* sp.) are minor diseases in conventional apple production as they are controlled by fungicide sprays for scab and mildew. In organic apple production they are more important because they are not controlled adequately by sulphur or copper sprays applied for scab or mildew control. The varieties E11/20 (now Park Farm Pippin), Early Victoria, Falstaff, Northern Greening and Winston Red Sport had a high incidences of leaf spot in 2003. Mother, Northern Greening and Winston Red Sport have proved consistently susceptible to leaf spot over the five years. Infection was found also on the fruits on the variety Falstaff, a potential problem with organic production of this variety. Infection on the fruits of Early Victoria has occurred at high levels in previous years.

**Rosy apple aphid:**

The incidence of aphids was low and they were patchily distributed. Those varieties which sustained colonies of rosy apple and/or rosy leaf curling aphid are clearly at least partially susceptible to the respective species. However, the patchy incidence meant that it is not possible to conclude that varieties where no aphids were recorded are not susceptible.

Varieties of high susceptibility to rosy apple aphid identified to date are Boscoop, Discovery, Egremont Russet, Greensleeves, Northern Greening and Vanda. No rosy apple aphid has been found on Goldrush in any of the five years. This does not mean it is necessarily completely resistant as infestation by the pest is sporadic and patchy. It might have escaped infestation partly (or wholly) through random chance.

### **Crop load:**

The mean crop load (number of apples fruits per tree) each year from 1999-2002 and the mean total crop load are given in Table 4. No crop was present in 1998, the year of planting. The varieties Judeline and Prima have had by far the highest total crop load, bearing a total of well over 200 apples per tree over the four year cropping period to date. Falstaff, Greensleeves and Priscilla have also cropped well with a total of over 150 fruits per tree. Antonoulka, Edward VII, Mother and Northern Greening have cropped poorly, bearing a total of less than 50 fruits per tree over the 4 year cropping period.

### **Acknowledgements**

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### **References**

**Cross J V. & Berrie A M. 2000.** Susceptibility of 42 apple varieties to pests and diseases 1998-2000. Report on Apple and Pear Research Council project SP119 issued 14 November 2000, 13pp.

**Cross J V. & Berrie A M. 2002.** Susceptibility of 42 apple varieties to pests and diseases 2001. Report on Apple and Pear Research Council project SP119 issued 18 March 2002, 9pp.

**Table 2. Mean scores of pests and diseases on 16 July 2002**

	1 mildew count	Square root 1 mildew score	2 mildew score	Square root 2 mildew score	Leaf scab score	Fruit scab score	Leaf spot on leaf score	Leaf spot on fruit score	Cankers per tree	Crop load (fruits/tree)	RAA colonies / tree	RLCA colonies / tree	Codling score
A567/19	12.4	3.5	3.0	1.7	0.0	0.0	1.0	0.0	0.0	15.5	0.6	0.0	0.0
A931/15	3.8	1.8	2.9	1.7	0.6	1.0	1.5	0.0	0.1	19.9	0.1	0.0	0.1
A93/16	4.6	2.0	2.4	1.6	1.0	1.0	1.4	0.3	0.0	20.1	1.1	0.0	0.0
Antonoulka	0.0	0.0	2.5	1.5	0.0	0.0	1.4	0.0	0.0	7.3	0.4	0.0	0.0
Boscoop	2.4	1.5	2.0	1.4	1.9	1.9	2.3	0.0	0.0	29.9	1.3	1.1	0.1
Ceeval	5.3	2.3	2.0	1.4	0.3	1.1	1.0	0.0	0.4	21.0	0.0	0.0	0.0
Delorina	18.3	4.0	4.2	2.0	0.0	0.0	1.5	0.9	0.0	14.5	0.0	0.0	0.0
Discovery	0.0	0.0	1.0	1.0	0.0	0.0	1.0	0.0	1.3	21.1	1.4	0.0	0.0
Double red wealthy	0.6	0.5	2.4	1.5	0.8	1.6	1.6	0.0	0.1	16.5	0.0	0.0	0.1
E11/20	0.8	0.6	0.1	0.1	0.0	0.0	2.5	2.3	0.0	43.3	0.9	0.0	0.1
E83/4	8.8	2.9	3.0	1.7	1.9	1.5	1.5	0.0	0.3	37.3	1.6	0.0	0.0
E210/198	2.4	1.2	2.0	1.4	4.0	2.9	1.4	0.5	0.0	28.1	0.0	0.0	0.0
Early Victoria	0.3	0.3	1.3	1.1	0.0	0.0	2.9	0.0	0.3	14.0	0.0	0.0	0.1
Edward7	5.6	1.9	1.5	1.2	0.0	0.0	1.4	0.0	0.1	16.1	4.9	0.0	0.0
Egr rus	9.6	3.0	2.4	1.5	1.9	1.1	2.1	0.0	0.3	39.8	0.6	0.0	0.0
Falstaff	0.8	0.5	1.3	1.1	1.4	1.1	3.4	1.0	0.0	40.5	0.3	0.3	0.0
Fiesta	2.9	1.4	2.5	1.6	2.8	2.3	1.8	0.0	0.4	18.8	0.9	0.0	0.0
Florina	0.5	0.4	1.4	1.2	0.0	0.0	1.0	0.5	0.5	35.1	0.0	0.0	0.0
Freedom	25.8	5.0	2.3	1.5	0.0	0.0	1.3	0.7	0.0	26.5	0.8	0.0	0.0
Goldrush	4.1	2.0	5.0	2.2	0.0	0.0	0.6	0.4	1.0	59.1	0.0	0.0	0.0
Greensleeves	4.8	2.1	2.3	1.5	3.1	3.4	0.8	0.1	2.5	26.6	0.0	0.0	0.0
Herrings pippin	1.0	0.8	1.9	1.3	0.3	0.0	0.5	0.0	0.0	38.8	0.0	0.0	0.4

**Table 2 continued**

	1 mildew count	Square root 1 mildew score	2 mildew score	Square root 2 mildew score	Leaf scab score	Fruit scab score	Leaf spot on leaf score	Leaf spot on fruit score	Cankers per tree	Crop load (fruits/tree)	RAA colonies / tree	RLCA colonies / tree	Codling score
Judeline	0.3	0.2	2.6	1.6	0.0	0.0	2.3	0.0	0.0	47.7	0.9	7.0	0.0
King of pippins	23.0	4.8	3.6	1.9	0.0	0.0	0.4	0.0	0.0	32.7	0.0	0.0	0.1
Liberty	4.8	2.0	2.9	1.7	0.0	0.0	2.4	2.1	0.8	73.4	0.0	0.0	0.0
Lord lamb	0.1	0.1	0.8	0.8	0.9	0.3	0.9	0.0	0.0	32.6	1.3	0.0	0.4
Mother	3.8	1.5	2.6	1.6	0.8	1.1	2.4	0.0	0.0	23.4	1.0	0.0	0.0
Northern greening	5.1	2.1	3.0	1.7	2.1	1.5	3.4	1.0	0.1	11.9	0.0	0.0	0.0
Prima	0.4	0.4	1.0	1.0	0.0	0.0	1.1	0.1	0.0	57.5	0.6	0.0	0.0
Princess	24.6	4.9	3.0	1.7	0.5	0.8	0.9	0.0	0.0	25.0	0.3	0.0	0.1
Priscilla	2.4	1.4	2.9	1.7	0.4	0.4	1.3	0.5	0.0	45.5	0.0	0.0	0.1
Red charles ross	0.7	0.6	1.9	1.3	1.9	0.3	1.0	0.0	0.0	19.7	0.0	0.0	0.3
Red ellison	0.3	0.3	1.0	1.0	0.0	0.0	1.1	0.4	0.5	9.3	0.1	0.0	0.0
Red fortune	0.1	0.1	2.1	1.5	0.0	0.0	1.5	0.0	0.0	17.6	0.0	0.0	0.0
Redfree	1.6	0.9	1.4	1.2	0.0	0.0	2.0	0.0	0.0	38.0	0.7	0.0	0.0
Regent	0.0	0.0	1.6	1.2	4.0	4.4	1.9	0.9	1.4	32.9	0.0	0.0	0.0
Saturn	7.0	2.3	1.9	1.3	0.0	0.0	2.0	0.4	0.1	15.9	0.6	0.0	0.0
Sir prize	4.1	2.0	4.0	2.0	0.0	0.0	1.3	0.0	0.1	28.9	0.0	0.0	0.0
Vanda	1.9	1.1	1.7	1.3	0.0	0.0	1.1	0.0	0.6	35.3	0.0	0.0	0.0
Wealthy	0.3	0.3	1.8	1.3	0.5	1.4	2.3	1.1	0.0	17.9	0.0	0.0	0.1
Winston red sport	6.6	2.4	2.4	1.5	2.8	2.7	3.4	1.0	0.4	20.1	0.1	0.0	0.0
Wyken pippin	19.7	4.4	3.3	1.8	0.0	0.0	1.5	0.0	0.0	4.5	0.0	0.0	0.2

**Table 3. Incidence of diseases and leaf miners in autumn 2002**

	Diseases			Leaf miners			
	Scab	Mildew	Leaf spot	Stigmella	Lyometia	Phylloporcyter	Leucoptera
A567/19	0	2	1	0	1	2	1
A931/15 (Meridian)	1	1	1	0	1	2	1
A93/16	1	2	1	0	1	1	0
Antonoulka	0	2	1	0	0	0	0
Boscoop	1	1	1	0	0	1	0
Ceeval	2	ns	1	0	1	2	0
Delorina	1	2	0	0	1	1	0
Discovery	1	ns	1	0	1	1	0
D R.Wealthy	1	ns	1	0	0	2	0
E11/20	0	0	0	0	0	1	0
E83/4	3	1	1	0	1	3	0
E210/198	3	ns	1	0	1	1	0
Early Victoria	1	1	1	0	0	1	0
Edward VII	0	1	0	0	1	2	0
Egremont Russet	2	0	1	0	0	1	0
Falstaff	1	1	1	0	1	1	0
Fiesta	3	ns	1	1	1	1	0
Florina	0	2	0	0	1	2	0
Freedom	0	ns	1	0	1	3	0
Goldrush	0	2	1	0	1	2	0
Greensleeves	2	0	1	0	0	1	0
Herrings Pippin	1	1	1	0	1	1	0
Judeline	0	ns	2	0	1	2	0
King of Pippins	2	ns	1	1	1	1	0
Liberty	1	2	1	0	0	1	0
Lord Lambourne	1	ns	1	1	1	2	0
Mother	0	1	0	0	1	1	0
N. Greening	3	1	0	0	0	1	0
Prima	0	ns	0	1	1	2	0
Princess	0	1	1	0	0	1	0
Priscilla	0	1	0	1	0	2	0
Red Charles Ross	0	1	0	0	1	1	0
Red Ellison	1	0	0	0	0	1	0
Red Fortune	0	2	1	0	1	2	0
Redfree	0	ns	2	0	1	2	0
Regent	2	2	0	0	0	2	0
Saturn	0	ns	1	0	1	2	0
Sir Prize	1	4	1	0	1	2	0
Vanda	0	2	1	0	1	1	0
Wealthy	1	ns	1	0	0	1	0
Winston R S	2	1	2	0	1	1	0
Wyken Pippin	2	ns	1	0	0	1	1

**Table 4. Mean crop load (numbers of fruits per tree) in each year from 1999-2002 and total mean crop load for each variety**

	1999	2000	2001	2002	Total
A567/19	9.1	17.1	45.1	15.5	86.8
A931/15	2.8	13.5	27.8	19.9	64
A93/16	21.6	11.4	29.1	20.1	82.2
Antonoulka	8	0.8	12.4	7.3	28.5
Boscoop	4.1	8	18.6	29.9	60.6
Ceeval	7.8	20	54.6	21	103.4
Delorina	2.4	22.5	14.5	14.5	53.9
Discovery	11.5	7.8	25.8	21.1	66.2
Double R. Wealthy	13.6	26	28	16.5	84.1
E11/20	22.6	55	43.4	43.3	164.3
E83/4	3.8	26.3	41.9	37.3	109.3
E210/198	4.5	21.1	25.6	28.1	79.3
Early Victoria	9.1	17.3	18.1	14	58.5
Edward VII	5.5	16.3	11.9	16.1	49.8
Egremont Russet	11.3	16.4	33.5	39.8	101
Falstaff	35.9	48.9	66.3	40.5	191.6
Fiesta	19.9	38.9	56.9	18.8	134.5
Florina	10.8	30.9	52.5	35.1	129.3
Freedom	10.6	7.8	12.1	26.5	57
Goldrush	14.4	67.8	29.5	59.1	170.8
Greensleeves	19.6	23.6	59.4	26.6	129.2
Herrings Pippin	3.5	29.1	17.6	38.8	89
Judeline	48.1	84.4	56.4	47.7	236.6
King of Pippins	8	6.5	29.4	32.7	76.6
Liberty	19.1	46	42.5	73.4	181
Lord Lambourne	18.4	26.4	38.9	32.6	116.3
Mother	0.9	6.4	16.3	23.4	47
Northern Greening	7.8	5.9	15.3	11.9	40.9
Prima	7.5	113.1	68.8	57.5	246.9
Princess	22.3	17.9	56.1	25	121.3
Priscilla	17.9	29	68.1	45.5	160.5
Red Charles Ross	4.1	17.9	9.7	19.7	51.4
Red Ellison	16.3	27.5	60.5	9.3	113.6
Red Fortune	11.1	21.9	47.9	17.6	98.5
Redfree	15	48.3	27.1	38	128.4
Regent	9.3	20.6	30.9	32.9	93.7
Saturn	21	55.3	42.9	15.9	135.1
Sir Prize	11.3	8.9	34.7	28.9	83.8
Vanda	8.1	29.1	33.4	35.3	105.9
Wealthy	9.3	25	19.5	17.9	71.7
Winston R. Sport	10.8	31.3	13.8	20.1	76
Wyken Pippin	9.2	4.3	20.7	4.5	38.7