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An assessment of apple varieties for their suitability in organic production systems

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Abstract

Twenty seven varieties of apple were assessed for their susceptibility to apple scab, mildew and rosy apple aphid in a replicated experiment at East Malling Research. The varieties most affected by mildew were Goldrush, DL11, Liberty, Bohemia and Pinova. Ceeval, Discovery, Edward VII, Howgate Wonder, Rajka, Rebella and Topaz had the lowest incidences of mildew. The highest incidence of scab occurred on Pilot and Pinova, but infestation was low throughout the assessment period. In 2006 when aphid populations were high, Liberty, Goldrush and Delorina had no aphid infestations, and low infestations were seen on Edward VII, Resi and Santana.

Keywords: apple, *Venturia inaequalis*, *Podosphaera leucotricha*, *Dysaphis plantaginea*, susceptibility

Introduction

Nearly all of the popular commercial varieties of apples grown currently for the dessert, culinary and processing markets in the UK, exhibit susceptibility to the diseases scab (*Venturia inaequalis*) and mildew (*Podosphaera leucotricha*). Many are also sensitive to damaging pest species such as rosy apple aphid (*Dysaphis plantaginea*) and codling moth (*Cydia pomonella*). These diseases and pests are difficult to control within an organic production system, so alternative varieties that show resistance or tolerance are required to enhance the sustainability of organic fruit production. Suitable resistant varieties must also be of good quality (flavour, texture, juiciness) and appearance (colour and skin finish) to ensure that they can capture a significant proportion of the apple market.

As part of a UK HortLINK project (237/3, HL0150LOF Cross et al., 2005) information was collected on the attributes, including pest and disease susceptibility, of over 100 varieties, and from this list 27 were selected as suitable for trialling in an organic production system. All the other varieties initially evaluated were rejected on the basis of inferior fruit quality and/or other likely problems associated with cultivation under organic methods. The 27 selected varieties were planted in a replicated field experiment at East Malling Research where their susceptibility to scab, mildew and rosy apple aphid was assessed.

Methods

The trial orchard consisted of a replicated block design (three tree plots replicated six times) planted onto registered organic land at East Malling Research in 2002. An assessment of pests and diseases was made on 18th June 2003 and on 15 July 2004. Each tree was examined for signs of rosy apple aphid and leaf scab and the number of trees out of 18 showing signs of infestation was recorded. Ten leaves on each tree were examined for symptoms of secondary mildew (180 leaves in total per variety).

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In early July 2006 all shoots from each tree were examined for rosy apple aphid damage and the number of trees infested was recorded.

Results

During 2003, the variety most affected by mildew was Goldrush, with a total of 95 leaves showing symptoms of mildew (Table 1). The varieties DL11, Liberty, Bohemia and Pinova also had high levels of infection (more than one third of leaves examined had symptoms of mildew). In 2004, Goldrush again had the highest incidence of mildew with 120 out of 180 leaves showing symptoms of mildew. The varieties Delorina, DL11 and Liberty also continued to show relatively high levels of susceptibility.

Table 1. Incidence of secondary mildew, scab, and rosy apple aphid on different varieties in the trial plot at EMR. Assessments were made on 18 trees per variety except in 2006 where the number of trees infested and the number of trees alive were recorded.

Variety	Number of mildewed leaves		Number of scab infected trees		Number of trees infested with rosy apple aphid		
	2003	2004	2003	2004	2003	2004	2006
Ariwa	50	50	0	0	6	2	14/18
Bohemia	61	33	0	1	3	2	16/17
Ceeval	16	12	0	0	4	5	14/16
D3	24	7	0	0	5	2	14/15
Delorina	48	74	0	0	0	0	0/15
Discovery	5	7	0	0	6	4	12/14
DL11	70	70	0	0	2	3	10/14
Ecolette	27	24	0	1	8	3	16/16
Edward VII ⁺	13	5	0	0	1	2	4/17
Encore ⁺	28	10	0	2	0	1	7/11
Florina	32	17	0	0	4	6	15/18
Goldrush	95	120	0	0	0	0	0/17
Howgate W ⁺	7	8	0	0	9	5	11/16
Judeline [*]	44	42	0	0	1	2	10/17
Liberty	69	58	0	0	0	0	0/13
Pikant ⁺	19	31	0	0	4	2	9/16
Pilot	34	46	0	13	5	9	15/17
Pinova	65	33	0	15	3	7	11/18
Rajka	14	3	0	0	5	2	9/11
Rebella	11	7	0	0	6	7	15/18
Red Falstaff	57	22	0	6	8	6	12/15
Resi	58	43	0	0	3	1	5/16
Rubinola	34	11	0	0	1	0	9/11
Rubinstep	35	16	0	4	10	9	13/17
Santana	34	39	0	2	2	1	6/17
Topaz	16	12	0	0	3	4	13/14
Worcester P	29	7	0	1	5	3	14/16

Varieties tested are recommended for the fresh fruit market with the exception of:

⁺ culinary varieties; ^{*} variety recommended for juice production.

During 2003, no scab was found on any variety due to the very dry weather in that year (Table 1). Despite the wet spring, incidence of scab on both leaves and fruit was also low on most varieties in 2004.

The highest incidence of scab in 2004 occurred on Pilot and Pinova (neither variety is scab resistant) with small amounts of both leaf and fruit scab on Bohemia, Ecolette and Encore (all reported as scab resistant), Red Falstaff and Worcester Pearmain (no resistance) and Santana (reported as scab resistant). Low levels of leaf scab were also found on Rubinstep (reported as scab resistant) and low levels of fruit scab were found on Ceeval, Discovery and Judeline.

During the assessment period 2003-2004, rosy apple aphid populations within the orchard remained low and patchily distributed. Liberty and Delorina were the only varieties to remain completely free of the aphid in 2003-2004 (Table 1). In 2006 the rosy apple aphid infestation was high and fairly evenly distributed across the orchard. Liberty, Goldrush and Delorina had no aphid infestations, and low infestations were seen on Edward VII, Resi and Santana. An assessment of mildew in the orchard at the time of the aphid sample in early July showed that there were high levels of mildew on Delorina, DL11, Goldrush, Pinova and Resi.

Conclusions

In this field assessment of apple variety susceptibility to pests and diseases:

- Ceeval, Discovery, Edward VII, Howgate Wonder, Rajka, Rebella and Topaz showed the lowest incidences of mildew.
- The highest incidence of scab occurred on Pilot and Pinova.
- Liberty, Goldrush and Delorina appeared to be resistant to rosy apple aphid. However, two of these varieties, Goldrush and Delorina, were susceptible to mildew.

References

Cross, J.V., Berrie, A.M.E., Firth, C., Johnson, D., Knight, S. & Xu, X-X. (2005). Varieties and integrated pest and disease management for organic apple production. *Final Report on LINK Project 237/3, HL0150LOF*.