

CRABAPPLES RESISTANT TO APPLE SCAB AND JAPANESE BEETLE IN INDIANA

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The range of form, flower, and leaf color that crabapples can offer has made them one of the most popular small trees in Indiana landscapes. Two defoliating pests, apple scab and Japanese beetle, have also given this plant a reputation of being prone to insect and disease problems. Both these pests are widely distributed in Indiana. Apple scab is a fungal

disease that infects leaves throughout the growing season when temperature and leaf wetness favor spore germination. Infected leaves eventually turn yellow and drop prematurely. The Japanese beetle is a flying insect that consumes leaves when it is in the adult stage, from late June through August. Planting crabapple cultivars with “good” resistance to these pests can greatly reduce the need for pesticides.

In this bulletin we place crabapple cultivars into one of 3 classes of resistance/susceptibility to each of these pests: Class I plants are highly resistant; Class II plants are moderately resistant; and Class III plants are highly susceptible. Cultivars with a Class I or II rating for both apple scab and Japanese beetle are likely to require little or no pesticide use to maintain their appearance in the landscape. In contrast, cultivars with a Class III rating for either Japanese beetle or apple scab are likely to require pesticide use to maintain their aesthetic appeal throughout the growing season. These cultivars are listed in table 3.



Figure 1. Apple scab infections can cause minor spotting on leaves.



Figure 2. More severe apple scab on a highly susceptible variety can result in black, velvety lesions. By midsummer, trees may lose a majority of leaves.

Evaluation Process

For apple scab evaluation, evaluators used between two and five replicates per accession in a completely randomized design. The soil type is silt loam (Beckerman et al. 2009). For Japanese beetle evaluation, raters examined 43 cultivars of 5–7 year old crabapples in LaPorte County, IN nursery during a severe outbreak in 1994 and 1995 as well as a replicated study of 42 cultivars in Lexington, KY (Spicer et al. 1995).

Apple Scab Rating

Cultivars were rated for apple scab severity on a scale of 0 to 3 with 0 = highly resistant to immune, no scab; 1 = resistant but with a trace of scab; 2 = susceptible to minor scab infection but without defoliation; and 3 = highly susceptible to scab and extensive defoliation. Cultivars were then placed into one of three Classes: Class I (0 rating): cultivars with high resistance to scab; Class II (>1 - 2 rating): cultivars with moderate resistance to apple scab; and Class III (=3 rating): cultivars with high susceptibility to scab (Table 1). Crabapple cultivars classified as highly susceptible to scab were partly to totally defoliated during our study.



Figure 3. A highly susceptible variety (foreground) is defoliated while more resistant varieties retains leaves until autumn.

Japanese Beetle Evaluation

Crabapple cultivars were rated in late July to determine the percent defoliation caused by Japanese Beetle. The maximum average defoliation we observed for any cultivar was 50% in any given year. Because the 1995 Kentucky study reported 100% average defoliation in the most susceptible cultivars, we incorporated their findings in our classification scheme. Cultivars with < 5 % defoliation in the Indiana study and < 25% defoliation in the Kentucky study were given a Class I rating. Cultivars consistently experiencing 5-15% defoliation in Indiana and a Kentucky rating of < 50% defoliation were given a class II rating. Finally, cultivars with consistently greater than 15% defoliation in Indiana or those

with > 50% defoliation reported in Kentucky studies were given a Class III rating.

Using the Tables to Meet Your Needs

Although both apple scab and Japanese beetle are serious pests of crabapples, apple scab is the most widespread and chronic problem on crabapples in Indiana. Indeed, apple scab has been at epidemic level except in 2012 and 2018. To prevent severe scab infection, fungicide sprays should be applied on a regular protectant schedule throughout the growing season, but especially during the early spring months, just before bloom, after bloom (to protect pollinators) and then every two weeks after until new growth has ceased.

In contrast, adult Japanese beetles have a more spotty distribution in the state. Hot spots, or regions where damaging numbers of beetles occur, will vary each year. Therefore, at any given site in the state, there are likely to be several years when Japanese beetle simply is not likely to damage a crabapple. So even though adult beetles fly in threatening numbers for about 5 weeks, crabapples are likely to require fewer pesticide applications for Japanese beetle than apple scab. We therefore suggest that apple scab be given priority when selecting crabapple cultivars in Indiana.

We believe the three classes accurately reflect cultivar resistance in those years when conditions are optimum for severe scab or Japanese beetle injury. Cultivars are grouped into classes to help nurserymen and homeowners choose cultivars that are less prone to problems. Cultivars in Class III are not recommended for future planting because in Indiana, they are likely to be severely defoliated by either apple scab, Japanese beetle, or both pests. Cultivars in both Classes I and II have sufficient resistance to be recommended for future planting.

References

- Richmond, Doug and Cliff S. Sadof. Japanese Beetles in the Urban Landscape. Publication E-75-W. <https://extension.entm.purdue.edu/publications/E-75/E-75.html>.
- Beckerman, J., Chatfield, J., and E. Draper, 2009. A 33-year evaluation of resistance and pathogenicity in the apple scab–crabapples pathosystem. *HortScience* 44:599-608.
- Beckerman, Janna. 2009. Managing Scab-Resistant Apples. Publication BP-76-W. <https://www.extension.purdue.edu/extmedia/BP/BP-76-W.pdf>.
- Pecknold, P. C. 2016. Apple Scab of Flowering Crabapples. Publication BP-39. <https://docs.lib.purdue.edu/cgi/viewcontent.cgi?article=2117&context=agext>.
- Beckerman, Janna. Apple Scab on Tree Fruit in the Home Orchard. Publication BP-1-W. <https://www.extension.purdue.edu/extmedia/BP/BP-1-W.pdf>.

Table 1. Classes of Crabapple Cultivars Based on Their Resistance to Apple Scab. Updated 2018

Class I High Resistance	Class II Moderate Resistance	Class III Susceptibility
Adirondack	Adams	Adams
<i>M. Baccata</i> 'Jackii'	Brandywine	Candied Apple
Bob White	Candymint	Indian Magic
Centennial	Centurion	Indian Summer
David	David	Profusion
Dolgo [^]	Donald Wyman	Robinson
<i>M. Floribunda</i>	Doubloons	Snowdrift
Golden Hornet	Harvest Gold	Velvet Pillar
<i>M. Halliana</i>	Harvest Gold	White Candle
<i>M. Halliana</i> 'Parkman'	Jewelberry	White Cascade
Liset	Louisa	
Makamik	Madonna	
<i>M. x Micromalus</i> 'Midget'	Mary Potter	
Ormiston Roy	Molten Lava	
Percifolia	Prairiefire	
Prairie Maid	Red Jewel	
Prairie Rose	Selkirk	
Red Jewel	Sentinel	
Rosseau	Silver Drift	
<i>M. Sargentii</i> 'Sargent'	Summer Snow	
Silver Moon	Tea	
Strawberry Parfait	<i>M. zumi</i> 'Calocarpa'	
<i>Sugar Tyme</i>		
<i>M. Tschonoskii</i> *		
White Angel		
<i>M. x</i> 'Wooster No. 1'		
<i>M. Yunnanensis</i> 'Veitchi'		
*Not recommended for planting because of susceptibility to fireblight.		
[^] Not recommended for planting because of large fruit.		

Table 2. Classes of Crabapple Based on Their Resistance to Japanese Beetle

Class I High Resistance	Class II Moderate Resistance	Class III Susceptibility
Ann E.	Candymint Sargent	Adams
<i>Bob White</i>	David	Baskatong
Brandywine	Indian Summer	Donald Wyman
Canary	Japanese Flowering	Doubloons
Candied Apple	Madonna	Indian Magic
Centurion	Molten Lava	Liset
<i>Harvest Gold</i>	Ormiston Roy	Mary Potter
Jack	Prairiefire	Prairie Maid
Jewelberry	Profusion	Robinson
Louisa	Redbud	Selkirk
Prairiefire	Sinai Fire	Sentinel
Red Jewel	Snowdrift	Sugar Tyme
Sargent		Velvet Pillar
Silverdrift		White Candle
Silver Moon*		
Tea		
White Angel		
White Cascade		
*Not recommended for planting because of susceptibility to fireblight.		

Table 3. Crabapple Cultivars Not Recommended for Wide Scale Planting in Indiana		
Cultivar	Apple Scab	Japanese Beetle
Adams	3	3
Baskatong	1	3
Candied Apple	3	1
Donald Wyman	2	3
Doublings	2	3
Indian Magic	3	3
Indian Summer	3	2
Liset	1	3
Mary Potter	2	3
Prairie Maid	1	3
Profusion	3	2
Robinson	3	3
Selkirk	2	3
Sentinel	2	3
Snowdrift	3	2
Sugar Tyme	1	3
Velvet Pillar	3	3
White Candle	3	3
White Cascade	3	3
*1 = highly resistant, 2 = moderately resistant, 3 = highly susceptible		

READ AND FOLLOW ALL LABEL INSTRUCTIONS. THIS INCLUDES DIRECTIONS FOR USE, PRECAUTIONARY STATEMENTS (HAZARDS TO HUMANS, DOMESTIC ANIMALS, AND ENDANGERED SPECIES), ENVIRONMENTAL HAZARDS, RATES OF APPLICATION, NUMBER OF APPLICATIONS, REENTRY INTERVALS, HARVEST RESTRICTIONS, STORAGE AND DISPOSAL, AND ANY SPECIFIC WARNINGS AND/OR PRECAUTIONS FOR SAFE HANDLING OF THE PESTICIDE.

May 2019

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This work is supported in part by Extension Implementation Grant 2017-70006-27140/ IND011460G4-1013877 from the USDA National Institute of Food and Agriculture.