

Manage Nightshades to Reduce Crop Loss

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Many New York vegetable growers complained about the abundance of nightshades on their farms last year. The warm spring of 2010 favored early germination of nightshade and other weeds (Table 1). For processing pea growers, nightshades turned to nightmares as many fields with bountiful pea crops were rejected by processors at harvest time because nightshade berries have similar size and shape as peas (Figure 1). Similar crop loss can occur in beans where nightshade berries stain and cause soil to stick to pods. Nightshades should be managed in other crops as well because they reduce crop yields, and harbor diseases of Solanaceous crops such as early blight and late blight of potatoes and tomatoes. Nightshades may become more of a problem in NY if early, warm spring weather becomes a more frequent pattern.

Table 1. The warm spring of 2010 created ideal conditions for early germination of nightshade species in New York. Nightshades germinate at temperatures between 68 – 115 °F.

2010 Month	Days favorable for nightshade germination
April	7 days (70 – 80° F)
May	18 days (75 – 85° F)
June	17 days (75 – 80° F)
July	26 days (75 – 94° F)



Figure 1. Berries of Eastern Black Nightshade caused this field of peas in WNY to be rejected by processors.

NIGHTSHADE SPECIES - In New York we are primarily concerned with Eastern Black Nightshade (*Solanum ptycanthum* Dun.) and Hairy Nightshade (*S. sarrachoides* Sendt.). Knowing which

species you have on your farm/fields is important for both cultural and chemical control strategies. The good news is that the two are fairly easy to tell apart (Table 2, Figure 2).

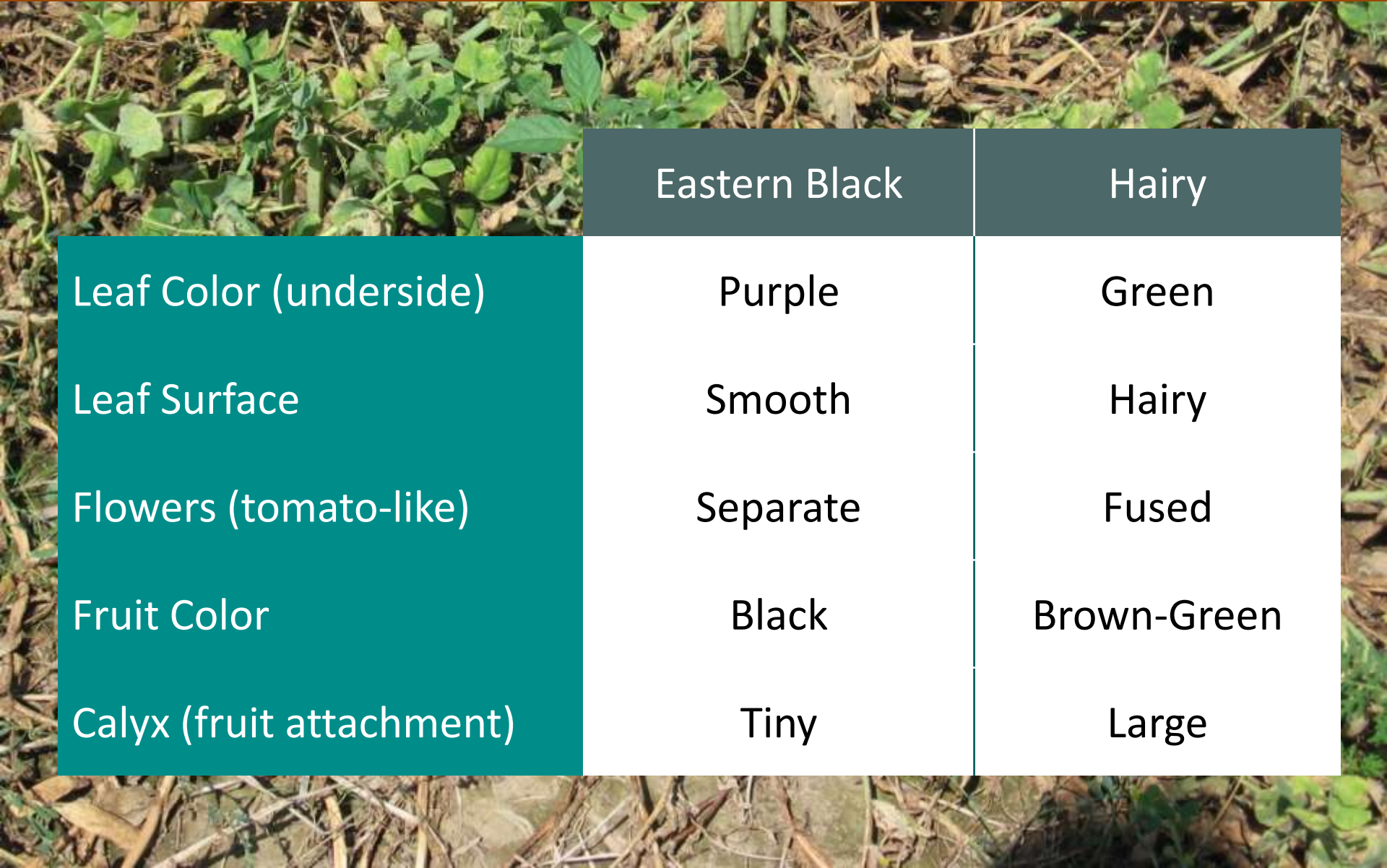
EASTERN BLACK NIGHTSHADE - This species is a North American native. Plants grow up to 3 feet tall but are more frequently spread out. Leaves are generally oval or at maturity, diamond-shaped with “wavy edges,” not serrated. Leaves and stems may have a few hairs but cannot be called “hairy.” Seedling leaves are usually red-purple underneath and foliage has a shiny, almost translucent appearance. Flowers, borne in clusters of 3-5 blossoms, resemble tomato flowers and are white with purple streaks with a yellow star in the center. The flower petals are separate, not fused. The calyx (collection of small green leaves called sepals that surround the flower petals) is usually small and often fused around the stems of the berries. Mature berries are dull or shiny purplish black and each berry can contain from 50 to 110 tan seeds.

HAIRY NIGHTSHADE - This species is a native of South America. Mature plants may grow to be 2.5 ft. tall but more often are spreading. Leaves resemble those of Eastern black nightshade in shape, oval to diamond-shaped. But unlike Eastern black nightshade, seedling leaves are not purple underneath, the leaves and stems are covered with hairs so that they are sticky or “clammy” to the touch, and leaves are not shiny, but are opaque to light. Flowers are borne in clusters, often containing as many as 7 blossoms. The petals are white with a yellow and purple star. The petals are fused, giving each petal a triangular shape. The calyx is very hairy and enlarged, often covering 1/3 to 1/2 of the mature berry. Mature berries are brownish green to olive green, dull or shiny, and have an unpleasant odor. Each berry contains 10 to 35 light brown seeds.

Table 2. Characteristics of Eastern Black and Hairy Nightshade

	EASTERN BLACK	HAIRY
Leaf Color (underside)	Purple on immature plants	Green
Leaf Surface & Stem	Smooth	Moderate to densely hairy
Flower petals (tomato-like)	Separate	Fused
Fruit Color	Deep purple to black	Brown-Green
Calyx (fruit attachment)	Tiny	Large
Germination	68°-115° May-June	68°-115° May-August
Seed Maturity	2-4 weeks	4-5 weeks
Seed Numbers	50-100/berry 488,000+/plant	10-35/berry 16,200+/plant
Longevity	10+ years	10+ years

Physiological Differences between Eastern Black and Hairy Nightshades



	Eastern Black	Hairy
Leaf Color (underside)	Purple	Green
Leaf Surface	Smooth	Hairy
Flowers (tomato-like)	Separate	Fused
Fruit Color	Black	Brown-Green
Calyx (fruit attachment)	Tiny	Large

Nightshades: Seedling Characteristics

Eastern Black Nightshade



Hairy Nightshade



Nightshades: Leaf Characteristics

Eastern Black Nightshade



Hairy Nightshade



Nightshades: Flower Characteristics

Eastern Black Nightshade



Hairy Nightshade



Nightshades: Fruit Characteristics

Eastern Black



Eastern Black

Hairy

Top View



Side View



Hairy Nightshade



WHY HAVE THESE SPECIES BECOME A PROBLEM? - *Their numbers have increased because cultivation and hand-weeding decreased following the introduction of selective herbicides in the early 1960's.

*Use of monoculture or short crop rotations encourages seed buildup.

*They are extremely successful as weeds because they emerge over an extended period of the growing season, they grow rapidly and are competitive, and they produce large quantities of viable, long-lived seeds.

GERMINATION AND EMERGENCE: These species germinate in the field, at soil temperatures between 68 and 115°F with 86°F being optimum. They generally will not germinate below 68°F. Seeds may be viable, on the plant, 2-4 wks (Eastern Black) or 4-5 wk (Hairy) after pollination. 91% germination 8 wks after pollination has been reported for Eastern black nightshade. However, most seeds become dormant shortly after berry ripening. Species differ in their emergence patterns. Eastern black nightshade appears to emerge early and then cease by late June to early July. Hairy nightshade, on the other hand, has several emergence peaks throughout the season. Shallow tillage enhances germination and emergence of Eastern black but has little effect on emergence of Hairy nightshade. Neither species will generally emerge from depths greater than 2.5 in and maximum emergence occurs in the top 1-2 in of soil.

GROWTH: Those plants that emerge in the late spring produce the greatest biomass, and the most berries and seeds. All nightshades are, however, very sensitive to shading. Plants that emerge in the early spring begin flowering 7-9 wks later; those that emerge in July flower at 5-7 wk, but when not competing with a crop may begin flowering 1-3 wk after the 5-leaf stage. Nightshades are not killed by light frosts and seeds in existing berries continue to ripen after plant senescence. Eastern black is more frost tolerant than Hairy nightshade.

SEED PRODUCTION: There are multiple reports from different states and the UK that reveal that the number of seeds produced by nightshades is dependent upon the time of plant emergence, the amount of competition, and the degree of shading during floral initiation. Plants that emerged in March, August, and September produced 410, 620, and 30 berries/plant, respectively. When grown without crop competition, Eastern black nightshade has been found to produce a maximum of 825,000 seeds/plant, with a range from 488,000 to 825,000. When grown in 94% shade (common under a bean canopy) only 966 seeds/plant were produced. In California, hairy nightshade has been found to produce an average of 16,200 seeds/plant. A common method of reducing berry and seed production in soybeans is to go to narrow row-spacing. Shading causes flower abortion and reduces nightshade berry production by up to 50%.

SEED LONGEVITY: The majority of seeds remain viable for more than 10 yr. One study using buried seeds, found viable seeds in undisturbed soils 39 yr after burial. In other studies, it was determined that seed viability decreased exponentially 22-26% per year. If this continued at a constant rate of 22%/yr then 1% of the initial seed population would still be viable after 18 yr.

CONTROL:

1. Good planting practices to obtain dense, uniform crop stands
2. Timely cultivation
3. Prevent formation and ripening of berries (clean up fields after harvest)
4. Use of small grains as a smother crop in the crop rotation sequence
5. Narrower row-spacing if it results in shading out weeds.
6. Herbicides (Control is difficult because the species are differentially sensitive to herbicides. A claim of control on an herbicide label may not be specified by species. Also, species exhibit different behaviors when grown under different geographic and environmental conditions. In other words, Eastern black nightshade in New York, may not be equally sensitive to a particular herbicide as the same species grown in Minnesota.). Table 3 lists some herbicides used on vegetables in NY that provide control of nightshades.

Table 3. Herbicides with good to excellent activity against nightshades in vegetable crops. This is meant as a starting point only. **Make sure to read the product labels for specifics as to crops labeled, timing, rates, size of weeds controlled.**

HERBICIDE	TIMING	EASTERN BLACK	HAIRY
Atrazine	PPI/PRE/POST + OIL	YES	YES
Basagran	POST	NO	YES
Buctril	POST	YES	YES
Callisto	PRE/POST	YES	YES
Chateau	PRE	YES	YES
Dual Magnum	PRE	YES	NO
Eptam	PPI	YES	YES
Goal	PRE/POST	YES	YES
Goal Tender	PRE/POST	YES	PRE-only
Impact	POST	YES	YES
Kerb	PRE only	YES	YES
Laudis	POST	YES	YES
Outlook	PPI/PRE/POST	YES	YES
Pursuit	PPI/PRE/POST	YES	YES
Pyramin	PRE	YES	YES
Raptor	POST	YES	YES
Reflex	PRE/POST	YES	YES (fair POST)
Ro-Neet	PPI	Not on label	YES
RoundUp	POST	YES	YES
Stinger	POST	YES	YES