

## Do Rotations Matter Within Disease Management Programs?

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As agricultural land becomes more scarce, existing farms become more specialized, and land closest to roadside markets increases in value, in part due to the advertisement-value of growing some crops where they can be seen and/or harvested by customers, an increasing number of farmers are considering shorter rotations for some of their plantings. Indeed, it can be very tempting to shorten rotations.

What would happen if one were to ignore rotations, that is, if one were to plant the same crop in the same field year after year? This was done in Penn State research fields for both tomatoes and for muskmelons. The results are summarized below in Table 1 (tomato early blight) and Table 2 (muskmelon/cantaloupe *Alternaria* blight).

**Table 1. Defoliation associated with *Alternaria* early blight on tomatoes after growing tomatoes in the same field for 1, 2, 3, and 4 successive years.**

<u>Successive Years</u>	<u>% Defoliation when 5% fruit were ripe</u>
Year 1	3
Year 2	30
Year 3	74
Year 4	70

**Table 2. Date when *Alternaria* blight first appeared on muskmelons (cantaloupes) for successive years after muskmelons were grown repeatedly in the same field (from 1977 through 1981).**

<u>Successive Years</u>	<u>Years Grown</u>	<u>First date when <i>Alternaria</i> Blight was first observed</u>	<u># Days before Aug. 8.</u>	<u># Days after June 1</u>
Year 1	0	August 8	0	69
Year 2	1	August 3	5	64
Year 3	2	July 29	10	59
Year 4	3	July 25	14	55
Year 5	4	July 18	21	48

The results provide a clear indication of the value of rotations relative to diseases caused by pathogens that can survive either in soil or in association with refuse from diseased plants. Many vegetable diseases are in this category.

Traditional wisdom and common-sense, combined with results such as those presented in tables above, tell us that rotations are important. Interpretation of results from various field, greenhouse and lab studies, and observations by many plant pathologists, suggest a minimum number of years that a grower should avoid growing crops affected by specific diseases (See Table 3). All vegetable growers should consider this information seriously as they plan crop rotations within their disease management programs.

**Table 3. Minimum years to avoid crops susceptible to specific diseases.**

<u>Vegetable</u>	<u>Disease</u>	<u>Period without a susceptible crop</u>
<b>Asparagus</b>	Fusarium wilt & root rot	Indefinite; do not plant without fumigation.
<b>Beans</b>	Root rots White mold, Sclerotinia Anthracnose Bacterial blight	3 years; use grain crops, including sweet corn in rotation 3 years; avoid tomato, potato, lettuce, cabbage, celery, carrot. 2 Years 2 Years
<b>Beets</b>	Cercospora leaf spot Root rots	3 Years 3 Years; use grain crops, including sweet corn in rotation
<b>Cabbage – related plants</b>	Clubroot Fusarium yellows Blackleaf Black rot White mold	7 years; avoid turnip, radish; adjust pH to 6.8 or above Many years 3-4 years; avoid turnip 2-3 years; avoid turnip 3 years; use grain crops, including sweet corn in rotation
<b>Carrots</b>	Leaf blights (fungal & bacteria)	2-3 years
<b>Celery</b>	Leaf blights	2 years
<b>Corn, Sweet</b>	Smut Yellow leaf blight Northern leaf blight	2-3 years 3 years 2 years
<b>Cucumber</b>	Scab, GSB & leaf spots	2 years; GSB = gummy stem blight
<b>Eggplant</b>	Verticillium wilt Fruit rots	4-5 years; avoid tomato, potato, pepper, strawberry, brambles 3 years
<b>Lettuce</b>	Bottom rot (Rhizoctonia) Drop, Sclerotinia	3 years 3 years; avoid tomato, potato, beans, cabbage, celery, carrot
<b>Muskmelon =Cantaloupe &amp; Watermelon</b>	Leaf spots, GSB, & Scab Fusarium wilt Gummy stem blight (GSB) Fusarium wilt	2+ years; avoid other cucurbits 4+ years; watermelon Fus. wilt is different 2 years; avoid muskmelon, pumpkin, squash 4+ years; muskmelon Fus. wilt is different
<b>Onion</b>	Leaf blights	1-2 years
<b>Parsley</b>	Damping-off	3 years
<b>Parsnip</b>	Leaf spot & Root canker	1-2 years
<b>Peas</b>	Root rots Fusarium wilt	3-4 years 4-5 years
<b>Peppers</b>	Bacterial spot Phytophthora blight	2 years 3 years; avoid tomato, eggplant, cucurbits.
<b>Potato</b>	Verticillium wilt Sclerotinia stalk rot Rhizoctonia canker Silver scurf Early blight Pythium leak; pink rot Common scab	3-4 years without tomato, eggplant, pepper 4 years; avoid tomato, lettuce, beans, cabbage, celery, carrot. 2-3 years; best with 2 year grass or 1 year cereal 2 years; primarily from seed tubers 2 years; avoid tomato 4 years 2-3 years; no root crops; adjust pH to 5.2 or below
<b>Pumpkin &amp; Winter Squash</b>	Angular leaf spot Black rot (GSB) Fusarium crown & Fruit rot Phytophthora blight Scab	1-2 years 2+ years; avoid muskmelon, watermelon, and other cucurbits. 3 years; avoid other cucurbits 3 years; avoid tomato, pepper, eggplant, and other cucurbits. 2 years

<b>Radish</b>	Clubroot	7 years; avoid turnip, cabbage-related plants; adjust pH to 6.8
<b>Turnip</b>	Clubroot	7 years; avoid radish, cabbage-related plants; adjust pH to 6.8
<b>Spinach</b>	Downy mildew & white rust	2 years
<b>Sweet Potato</b>	Black rot & scurf Pox (soil rot)	3 years Few years; reduce soil pH below 5.2
<b>Tomato</b>	Bacterial canker Bacterial spot Bacterial speck Early blight Anthracnose Septoria leaf spot Fusarium wilt Verticillium wilt	3+ years 2 years; avoid pepper 1 year 2 years; avoid potato 2-3 years; avoid potato 1-2 years 3 years Several years; longest possible; avoid potato and eggplant