

Manitoba Mustard Biofumigation Recommendations [2022]

Planting

PLANTING DATE

- Original August planting date (with October biofumigation) can be used to raise a successful crop provided there isn't a wet fall with extended potato harvest.
- 2020 experiment focused on early June planting date with late August biofumigation date
 - Early June flea beetle damage expected to be less. Goal to have true leaves up before flea beetles begin to feed. Crucifer flea beetles thought to be more damaging than striped flea beetle in 2019.
 - Late August biofumigation date precedes bulk of potato harvest
 - Mustard growth from June – August is less than August-October, but both planting dates (June and August) can get 5-foot plants, 60-80 kg/m² (~270-360 US tons per acre)
- Seed treatment will be an ongoing area of experimentation. Seed treatment needed for flea beetle protection. Senator was used successfully in 2020, Buteo may be used in 2021.

DIRECT SEEDING

- Seeding rate between 6-10 lbs/ac depending on amount of residue
- Can be done in both heavy and light residue situations
- Makes for great seed to soil contact
- Caliente Brand seeds can be planted using main hopper or small seed attachment
- Drilling into dry soil and over circle tracks can be damaging to equipment. Cutting or filling tracks prior to planting helps

BROADCAST

- Seeding rate between 8-12 lbs/ac depending on amount of residue
- Use cheaper, dry fertilizer while simultaneously sowing
- After broadcasting, a pass with a undercutter, packer, harrow, or other tool will be required to ensure better seed to soil contact

FERTILIZER

- For maximum bio-fumigation potential, 120-180 units of available N are needed. Apply up to 90 units at seeding.
 - Shilo has needed higher rates of fertilizer than the Carberry area
- Working in residue prior to planting may require more fertility due to nutrient tie-up
- For maximum growth, 25-30 units Sulphur are also recommended (adjust to 6:1 ratio nitrogen to sulfur)

PACKING

- Seed to soil contact critical, more is better

- Multiple packer types will work: Schmeiser/Ring Packer, Tire Packer/Roller, Coil Packer
- Harrows can also be used: Spring tooth Harrows, Rolling Harrows
- Vertical tillage/cutter tools can be utilized in heavy residue

GENERAL

- When growing a Biofumigant crop behind wheat or other grasses, the use of a grass herbicide is highly recommended because volunteer grains compete for water and nutrients
- Mustard is likely to be tolerant to salinity stress
- It is possible that mustard biofumigation reduces wind erosion, but this depends on wind speed, particle size, frequency of wind, and duration of winds.
- Allowing the plants to enter full bloom before biofumigation is not a bad thing – glucosinolate concentration is high in petals, levels in leaves won't drop until petal fall as the plant sheds older leaves. Don't let the plant get beyond petal fall before biofumigating.

IRRIGATION

- The best results in Manitoba to date have been with 8 inches of water in the Carberry area and 9 inches of water in the Shilo Area.
 - 4-5 inches applied in the first month to keep the seedbed moist
- Shortly after seeding, multiple 1/4" shots of water are required to allow seeds to germinate
- In season, these bio-fumigant crops can use up to 2" or more per week
- When these plants are stressed for water, they will bolt and flower early (not what we want)

Incorporation

- The highest GL concentration is right at flowering, but these levels will hold for 2-3 weeks in cooler fall temps with adequate moisture
- As soon as flowers start dropping, so does the GL concentration
- For many areas, an August 5th planting date means middle to end of October for incorporation. This also avoids overlapping w/ harvest
- Ensure good soil moisture at incorporation to allow for rapid release of AITC's
- Extremely important to macerate plant tissue
 - Glucosinolate and enzyme are found in different parts of cell
 - Shredding thoroughly will allow for higher concentrations of AITC release and improved disease/pest/weed suppression
 - Flails tend to work better than mowers due to better mulching abilities.
 - Rears MFG makes a pul-flail that can be customized for more blades and higher arbor speeds, allowing for optimal AITC release
- **Flail the mustard – do not macerate plant tissue using any other way**

- We recommend residue is incorporated within 10-15 minutes of chopping. Sooner is better.
- Up to 80% of AITC can volatilize in the first 20 minutes after being chopped
- The most important rule for incorporating is to stay as close to the flail chopper as possible
- The use of a heavy offset disk or rototiller is recommended
- In extremely heavy residue, double disking is an option, but make second pass as close to first pass as possible
- Pull a heavy packer behind incorporation tool to seal soil
- If possible, a shot of water will help seal the soil surface

CAUTION

When planting directly after bio-fumigant incorporation, wait 10-14 days before planting

The AITC's released during bio-fumigation can be very phytotoxic

When planted too closely to incorporation, the AITC's have affected the germination of crops from corn and peas, to apples and potatoes

Good moisture at incorporation will speed up the release of AITC's

Flea beetle damage may be extreme without stubble protection. Foliar insecticides may be needed in certain situations, although exact thresholds have not been established