SELECTING A SORGHUM COVER CROP FOR INTEGRATED CROP PROTECTION

SoilWealth NURTURING CROPS

Integrated Crop Protection PROTECTING CROPS

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TIPS FOR SELECTING YOUR SORGHUM COVER CROP

- Choosing cover crops which are resistant and non-hosting of pests and diseases is the most reliable way for cover crops to contribute to an Integrated Crop Protection program, e.g., sorghum x sudangrass hybrid 'Jumbo' for root knot nematodes; sudangrass for soilbourne diseases.
- For a break crop to work, you must ensure volunteers and related weeds are well controlled.
- Use biofumigant cover crops only if you are prepared to manage their growth and incorporation to maximize the biofumigation activity.
- While most sorghum species will have some biofumigation activity, the only breed sorghum biofumigant cultivar ('Fumig8tor') is no longer available.
- Sudangrass cultivars have finer stems and less bulky root crowns, making them easier to manage. The cultivar sudangrass 'scavenger' has been selected for use as a general cover crop.
- For general cover crop and soil health benefits choose the locally recommended forage sorghum for maximum biomass production.

Sorghum (*Sorghum bicolor)*, sudangrass *(Sorghum sudanense)* and their hybrids (*S. bicolor* X *S. sudanense)* are popular summer cover crops. They provide excellent protection of the soil against summer storms, are drought and heat tolerant, good at suppressing weeds and recovering nutrients from depth, and can add large amounts of biomass back into the soil.

Sorghum species are also an excellent break crop for most vegetable growers and are useful as part of an Integrated Crop Protection (ICP) approach. Break crops can work in four ways;

1. Resistant – the pest or disease is unable to feed, effectively starving the pest or disease.
2. Trap crop – by attracting the pest and slowing or stopping their development.
3. Biofumigant – by producing natural biocide compounds which kill the pest or disease.
4. Soil health – encouraging general soil biology which competes with pests and diseases or feeds on resting structures such as eggs or sclerotia.

CHOOSING RESISTANT COVER CROPS IS THE MOST RELIABLE WAY TO REDUCING PEST AND DISEASE PRESSURE.

Resistant sorghum cover crops are the most reliable form of break crops for managing pests and diseases.

Sorghum is resistant to many common vegetable pest and diseases. For example, sorghum species are

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poor hosts of some nematodes, Pythium, Sclerotinia and verticillium wilt. Using selected sorghum in your rotation will provide a reliable way of reducing pest and disease pressure.

As a general guide, sudangrass has been found to be better at suppressing soilbourne diseases than sorghum or sorghum x sudangrass hybrids.

For nematode suppression cultivars matter!

Sorghum x sudangrass hybrid 'Jumbo' has been found to be most resistant to root knot nematodes and is a popular choice in northern Australia.

Sorghum species can host black rot (*Thielaviopsis basicola*) and should not be used prior to beans in your rotation.

For resistant cover crops to be effective, you must ensure volunteers and related weeds are well controlled. Failure to do this will allow pests and diseases to survive and grow on the volunteers or weeds, greatly reducing the effectiveness of resistant cover crops in managing pests and diseases.

Resistant cover crops are genetically determined. Once you have selected the right species or cultivar it is more likely to deliver the ICP benefits than a cover crop which relies on the biofumigation activity.

TRAP CROPS ATTRACT NEMATODES AND ONCE FEEDING ON THE ROOT, PLANT PRODUCED CHEMICALS SLOW OR STOP THEIR DEVELOPMENT.

Trap crops can be used for managing nematode pressures. The trap crop attracts the nematodes, which starts feeding on the root. In response, the roots produce compounds which slow or stop the nematode developing further and laying eggs.

Sorghum cover crops are most likely to have both resistance and trap crop properties. No specific trap crop cultivars are currently available in Australia.

USE BIOFUMIGANT COVER CROPS ONLY IF YOU ARE PREPARED TO MANAGE THEIR GROWTH AND INCORPORATION TO MAXIMISE THE BIOFUMIGATION ACTIVITY.

Most of us are more familiar with brassicas as biofumigant cover crops. But sorghum, sudangrass and their hybrids also have biofumigant potential as outlined in the Chemistry of biofumigation box below.

Biofumigants require careful management during growth and incorporation to maximise the biofumigation activity. Furthermore, to ensure the greatest impact on the target pest or disease, the time of incorporation is important to target the most vulnerable part of the lifecycle.

If you are going to use sorghum species as a biofumigant, here are some tips.

Growth

- Sow at high rates 30 – 40 kg/ha.
- Sow when soil temperature is above 18^{O}C to get good germination and early growth.
- You will need good water and nutrition – consider irrigation and fertiliser applications.

Incorporation

- Incorporate 4-6 weeks after sowing when the biofumigant compound - cyanogenic glucoside is at its highest levels.
- Biofumigant activity is more effective in moist sandy to sandy-loam soils.
- Chop as finely as possible – the finer the better to activate the biofumigation. Flail mowers with a rear "curtain" to keep the plant material in the mower for longer are the most effective.
- Incorporate into the soil as soon as possible through rotary hoeing or discing. The quicker the better as the hydrogen cyanide produced is

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volatile and will gas off quickly if not buried in the soil.

- Seal soil surface to trap compounds. Sealing the surface of the soil with irrigation or a light roller is required to trap volatile biocidal compounds in the soil.
- Observe a plant-back time of at least two weeks. Consider a bioassay to check before sowing the main crop.

Until recently the main sorghum biofumigation cultivar was 'Fumig8tor'. This is no longer available, mainly due to the small seed volumes sold.

Most sorghum species will have some biofumigation activity. However, there are currently no specific sorghum biofumigant cultivars sold in Australia.

CHEMISTRY OF BIOFUMIGATION

Brassicas are the most used biofumigants. The biofumigant action comes from naturally produced secondary compounds produced by brassicas – glucosinolates. ITC (isothiosyanates) are produced when glucosinolates mixes with the enzyme, myrosinase, also produced by brassicas. ITC has biocidal properties and is the same active ingredient in the chemical fumigant metham sodium.

Sorghum species can also produce a naturally occurring biofumigant compound - cyanogenic glucoside. When cyanogenic glucoside mixes with the sorghum-produced enzyme, dhurrinase, hydrogen cyanide is produced. Like ITC, hydrogen cyanide is a biocide.

While the sorghum and brassica plants have different biofumigation compounds, the process to activate these compounds is similar. The plant material must be finely mulched at the right time to mix the glucosinolates or cyanogenic glucoside with the enzyme to produce the biocidal activity.

Naturally, feeding insects or nematodes cause this mixing, with the ITC or hydrogen cyanide produced stopping many insects from feeding further.

SORGHUM FOR COVER CROP AND SOIL HEALTH BENEFITS

Sorghum can contribute large amounts of biomass to feed the soil biology and build soil organic matter – between 4 - 14 t/ha of dry matter. The general improvement in soil health can reduce pest and disease pressures as the more active soil biology feeds on pest and disease resting structures, such as eggs and sclerotia.

Choose a forage sorghum suited to your local conditions to ensure good growth. If you plan to grow it for a prolonged period, look for cultivars with good regrowth potential following slashing or grazing.

Prepared by Kelvin Montagu, December 2021.