Maintaining profitability in retained stubble systems on upper Eyre Peninsula

A joint EPARF and GRDC funded project.

Guideline 9: Sowing into medic stubbles

Ley farming systems in low rainfall, alkaline soil regions have traditionally used self-regenerating annual medic *(Medicago spp.)* as a low cost pasture phase to feed livestock, increase soil nitrogen, and to reduce levels of grass weeds and cereal diseases. However, medic stubbles or residues may cause issues for sowing the following crop due to the clumping of medic vines resulting in dragging, blocking and poor seed placement.

What are the benefits of medic pastures?

- ✓ **Naturally regenerating, low cost and productive livestock feed base**
- ✓ **Increased soil nitrogen levels if medic had effective nodulation in previous season**
- ✓ **Reduce cereal disease inoculum levels, providing grass weeds are removed**
- ✓ **Ability to reduce grass weeds numbers in farming systems if appropriate herbicides are used in the medic phase**
- ✓ **Earlier sowing opportunity in following season due to lower grass weed numbers**

What are the potential disadvantages?

- x **Tillage or burning may be required to reduce medic vine**
- x **Potentially uneven sowing depth and reduced establishment due to medic vines causing blockages during sowing**
- x **Perennial weeds (eg Lincoln weed, onion weed, marshmallow) may be an issue during and after the medic phase due to delayed weed control to allow medics to set seed**

Stubble management after pasture breaks

With medic forming an integral part of the farming rotation on upper EP, sowing into medic stubbles, especially using no-till systems, can be challenging. Medic vines may cause blockages and clumping during sowing, potentially resulting in uneven sowing depth and reduced crop establishment[1]. This means pasture paddocks to be sown with tined seeders are often cultivated[1], harrowed and burnt, or broken up using implements such as a Kelly disc chain or Trashcutters[2] prior to seeding.

Pastures that are problematic with no-till and have issues with sowing often have problem weeds or woody weeds, rough surfaces, no summer weed control, are rarely cropped, have lower nutrition and trash issues. Cultivation of these paddocks results in delayed sowing, moisture losses (up to 10-20 mm depending on soil type), burying weed seeds resulting in staggered weed germination and reduced herbicide efficacy, a flush of early mineral nitrogen, increased soil erosion potential and increased costs in labor, machinery use, fuel and maintenance[1].

Clumping of medic stubbles impact on crop establishment

When sowing with tined seeders to minimize residue stubble handling issues and minimise clumping[3];

- Reduce the amount of vine through grazing if possible and break it up to manageable levels.
- Cut or smash vine to shorter lengths in drier conditions and spread residue as evenly as possible.
- Removal of medic vine by harrowing and burning may be needed in some situations[1]
- Operate in dry conditions at a lower speed.
- Maximise tine seeder capacity to prevent clumping and blockages where the seeding tine vertical clearance should be at least 1.5 times the length of vine residue.

- Tine layout should be spread over 3 or 4 ranks to maximise the inter-tine spacing (Figure 1). The smallest inter-tine spacing within a layout represents its bottleneck and should be at least 1.3-1.5 times the residue length.
- The optimum tine shank should be straight with only gradual changes in shape, have a round cross-section and be vertical or slightly leaning backwards.
- Tine designs can be improved by adding simple round tubes known as residue guards. Their round, smooth surface improves residue flow and minimises hairpinning and residue catching often promoted by narrow edge-on shanks and protruding brackets.
- Residue cutting coulters preceding the seeding tines can improve residue flow provided they successfully cut through residue[3].

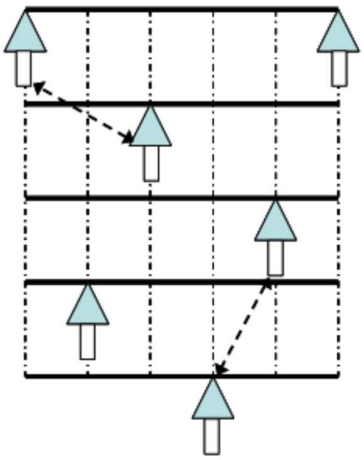

Figure 1 Tine layouts over 3 or 4 ranks increase the inter-tine spacing and greatly improve the drill capacity[3]

The use of disc seeders has been driven by their ability to handle heavier crop residues without clumping or blockages, and without specific requirements for stubble harvest or post-harvest management. A serious potential limitation however is residue hairpinning. Hairpinning is where uncut residue is pushed into the furrow by the disc opener resulting in seed to residue contact and poor furrow closure. This can reduce germination and seedling establishment. The ability to control hairpinning is therefore central to the success of disc seeders, and this is achieved along two principles: i) minimise the need for residue cutting and ii) maximise the capacity to cut residue[3].

The need for residue cutting is minimised by avoidance techniques such as[3]:

- Using residue managers (row cleaners). Row cleaners aim to remove excess residue in the path of the disc opener.

The capacity to cut residue is maximised by[3]:

- Operating in dry stubble and firm soil conditions.
- A sharp cutting edge with thin disc wedge angle to deliver an effective parting cut component of the residue cutting process. Disc blades can be sharpened to improve performance in challenging paddocks.
- An operating depth optimised for the disc size.
- Unconstrained disc drive to maximise the sliding cut component of the residue cutting process. Disc drive is improved by reducing all sources of drag affecting the disc rotation.
- High down pressure capacity on disc units to match requirements for cutting matted residue.
- Driving along the leaning direction of stubble to cut stems at an angle.

Any post-harvest working operation is to be avoided for disc seeders as residue handling is significantly impaired in soft soil conditions. Longer term zero-till farmers indicated hairpinning problems decrease over time as soil physical and biological health improve under an integrated controlled traffic and full residue retention system[3].

All growers implement some form of stubble management depending on the rotation phase, farming system, seeding equipment and set up, and weed and disease levels. In the research on medic stubble over three seasons on upper Eyre Peninsula medic pastures showed benefits by increasing soil nitrogen levels, and lowering grass weeds and disease inoculum. No issues were encountered with crop establishment at seeding in medic stubbles due to seeding in drier and warmer conditions, and the set-up of the tined seeding system used[4]. There were also no issues encountered when trying to establish medic pastures into barley residues in a trial at Mt Cooper, which is often raised as an issue by growers[5].

Tips for sowing into medic residues

- Plan ahead for sowing into medic pastures to ensure medic vine does not cause issues at seeding
- If cutting or smashing the medic vine do it in warm, drier conditions between January and March while the stems are brittle and more likely to break, but not in high fire risk situations[2]
- Aim for a vine length shorter than the smallest distance between the tine layout[3]
- If using a Trashcutter to cut medic vine, doing the operation twice at 90 degrees further reduced clumping during seeding[2]
- If possible sow pasture paddocks in warmer, drier conditions to allow better medic vine flow than wet, cold conditions[1]
- If using disc seeders operate in dry stubble and firm soil conditions with a sharp cutting edge with thin disc wedge angle. Disc blades can be sharpened to improve performance in challenging paddocks[3]
- Use high downward pressure capacity on disc units to match requirements for cutting matted residue and an operating depth optimised for the disc size[3]

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For more information contact: Amanda Cook, SARDI, 0427 270 154 amanda.cook@sa.gov.au

References

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