21. South Australian Industrial Hemp Trials

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KEY MESSAGES

- Industrial hemp shows potential as a summer irrigated rotation crop
- Shallow sowing (10-20 mm depth) is key to successful emergence and establishment
- High plant density (>75 plants/m^2) allows hemp plants to outcompete co-germinating weeds
- Water salinity above approximately 1500 ppm (2.7 dS/m) causes leaf burn and death of young plants
- Varieties still being evaluated for suitability to Riverland and Limestone Coast regions

Trial Background

The passing of the Industrial Hemp Act by the SA Parliament in April 2017 to legalise the production of industrial hemp crops within South Australia, and the agreement by state and federal governments to allow the sale of hemp products as food in November 2017, created the need for a solid research footing to support the development of a hemp growing industry within South Australia.

SARDI therefore committed to trial some of the most promising varieties available within Australia, across two of the potential production areas within South Australia, and test aspects of the timing and agronomy required to grow commercial crops of hemp for grain production, and assess the yield and quality of fibre and hurd produced as a by-product.

Activities

Two trial sites were established, at Loxton Research Centre and Kybybolite Research Centre. In 2017/18, five varieties were planted at each of five different sowing times, giving 25 combinations of variety by sowing time.

Plant counts were conducted at establishment, and plant height and growth stage were assessed throughout the growing season. Whole plants were harvested, and dry weight of all components evaluated (grain, raw fibre, hurd, other).

Grain quality was assessed by the University of Adelaide, and fibre yield and quality were evaluated by CSIRO.

Field days were held twice during the growing season at both sites, giving potential commercial growers the opportunity to observe the crop growing, and ask questions about hemp agronomy.

A preliminary report summarising the results of the 2017/18 trials is available for download via a link on the PIRSA website (http://pir.sa.gov.au/primary_industry/industrial_hemp).

Results and Discussion

Full trial results are available in the preliminary report, available via the link at http://pir.sa.gov.au/primary_industry/industrial_hemp. Key observations about industrial hemp agronomy are outlined below.

Seed was sown quite shallow (10-20 mm), as per recommendations. In the sandy soil at Loxton, sand drift buried emerging plants in some treatments, resulting in reduced establishment, leading in turn to high weed competition later in the season.

High plant density (>75 plants/m^2) ensured that hemp plants smothered any weeds which emerged after sowing. Pre-existing weeds should be controlled prior to sowing to minimise competition with emerging hemp plants.

Irrigation water salinity at Kybybolite in 2017/18 was around 2,000 ppm (3.6 dS/m). In early sowing times stored soil water and rainfall diluted this salinity, resulting in acceptable establishment and growth. In later sowing times the absence of rainfall meant that the crop experienced the full irrigation water salinity. Young plants

exhibited salt burn symptoms, and significant plant deaths were observed. Plants eventually grew out of the salinity symptoms, but plant density was significantly reduced, exacerbating weed competition.

Heavy rain at Kybybolite Research Centre shortly after the first sowing resulted in standing water for a number of days in some areas of the trial. The plants in these areas died due to waterlogging. Free draining soil is critical to successful hemp production.

Some of the varieties tested only flowered in response to diminishing day length, i.e. after New Year. Planting these varieties early (October/early November) resulted in a long growing season, producing large plants (up to 3 m tall at Loxton), and required large amounts of irrigation (up to 10 ML/ha at Loxton). Later planting (late November/early December) resulted in smaller plants (easier to harvest) and used less irrigation water.

Sowing late (late December, early January) exposed emerging seedlings to conditions of extreme heat and low humidity, reducing plant establishment.

Growth stages such as flowering, seed set and seed maturity are not well synchronised in industrial hemp varieties. Grain sets and matures progressively from the base to the tip of the flower head. Also, flower heads on adjacent plants will be at different stages of maturity. As a result some grain will begin to shatter from the heads whilst other grain is still unripe. Harvest is a compromise between losing grain on the ground and having immature grain in the harvest.

Conclusion

Industrial hemp has potential as a rotational crop under irrigation. Key consideration for growing industrial hemp include:

- Sow seed shallow, and protect from sand drift
- Test the germination rate of your seed, and calculate the seeding rate to achieve a plant density of around 100 plants/ m^2
- Only grow under low irrigation water salinity (<1500 ppm, <2.7 dS/m)
- Only grow in freely draining soils
- Sow seed between mid-November and mid-December

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