



The development of safflower as an alternative source of industrial oils may increase crop options for northern growers.

**PHOTO:** GRDC

Northern grain growers may be motivated to start planting ‘super’ safflowers in the next few years as new marketing opportunities emerge that will enhance the oilseed’s appeal as a viable break crop.

The GM super-high-oleic safflower oil (SHOSO) is the result of a long-running partnership between CSIRO and the GRDC through the Crop Biofactories Initiative, which was designed to examine potential plant alternatives to fossil fuels.

Traditionally, safflower has been grown for both industrial and food uses in Australia, with areas ranging from 6000 to 45,000 hectares; however, grower uptake has been limited by inconsistent prices and market opportunities.

The development of the new SHOSO safflower for use in the biodiesel industry and its commercial licensing in 2015 may strengthen the crop’s position as an agronomic and profit option in northern farming systems.

Research agronomist Kathi Hertel from the New South Wales Department of Primary Industries says safflowers are well suited to the northern region; however, their high water requirement and long growing season need to be offset by paddock benefits and/or profitability.



Kathi Hertel believes safflowers could be an option as a rotational crop for northern growers if work continues on market development.

**PHOTO:** Toni Some

“Safflower is well suited to the northern region and this, combined with industrial crop technology, creates a potential new industry – the production of renewable high-purity oleic acid oil suited to a range of compounds that can replace petroleum-based industrial chemicals,” she says.

Conventional dryland safflower crops average yields of 1 to 1.2 tonnes/ha. Grown under contract, prices averaged \$490/t in 2014 and \$520/t in 2015.

GRDC market analysis from several years ago indicated Australian demand for high-purity oleic acid oil could require more than 100,000ha of the new safflower varieties.

## Rotational fit

Used in rotation with cereal crops, safflower has the capacity to play a role in integrated disease, weed and pest management. It can be planted as a late winter crop if there is a late break or a failed crop.

“Safflower is an effective break crop for cereal diseases including crown rot, common root rot, yellow leaf spot and spot form of net blotch,” Ms Hertel says.

“It is also resistant to both *Pratylenchus thornei* and *P. neglectus* root lesion nematodes, as well as being heat and drought tolerant and suited to lower-rainfall areas where canola and sunflowers are not adapted.”

She says the oilseed is also subject to a different weed spectrum than most crops, offering growers the opportunity to control late-germinating and herbicide-resistant weeds.

But some safflower cultivars are susceptible to *Alternaria* leaf spot, rust and *Phytophthora* root rot. The crop is also an attractive food source for birds, so a degree of crop loss can be expected at some locations.

## Planting, harvest and beyond

In trials in the northern region, safflowers have been planted between June and August, with harvest after 110 to 170 days depending on location and seasonal conditions.



The development of safflower as an alternative source of industrial oils may increase crop options for northern growers.

**PHOTO:** GRDC

“The crop is widely suited to various soil types, but prefers soils with high water-holding capacities. It has deep roots though and, providing sufficient water is available, it tolerates hot conditions during maturation,” Ms Hertel says.

“Safflower also has the ability to use water deep in the soil profile and can effectively tolerate high salinity levels. Its deep rooting ability reduces waterlogging and improves nitrogen efficiency by using leached nitrogen at depth.”

But Ms Hertel says the trade-off is safflowers’ high water use in comparison with other winter crops, and the potential impact this can have for following crops.

CSIRO research at Dalby in Queensland during the 1980s compared soil water use in safflowers, wheat and chickpeas. The water use efficiency (WUE) results showed safflower to be 2.6 kilograms per hectare per millimetre, wheat 6.8kg/ha/mm and chickpeas 4.9kg/ha/mm. It was very dry, with below average rainfall and high evapo-transpiration rates throughout that particular season.

More recent GRDC-funded research revealed the crops had similar daily water use, but safflower's longer growing season (34 to 40 days longer than wheat) means it uses additional soil water.

## Northern edge

The northern region is characterised by a variable climate with predominantly high water-holding-capacity soils and an environment that suits safflower, with its heat and drought tolerance. Oleic oil synthesis within the seed is also favoured by warmer finishing conditions, promoting high oil content.

“While safflower potentially represents a future significant new crop industry for the northern growing region, the development of stable market opportunities is integral to the industry's development,” Ms Hertel says.

“As is ongoing research into the development of more cultivars, specifically quicker-maturing varieties with improved WUE and attributes such as Alternaria, rust and Phytophthora resistance.”