

**Modifying poppy growth and alkaloid yield
with plant growth regulators**

by

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ABSTRACT

Poppies (*Papaver somniferum* L.) are a major crop in Tasmanian broad-acre cropping rotations. Morphine has been the major alkaloid produced but now approximately half of the State's production is derived from thebaine-producing poppies. Yield potential in poppies is enhanced with earlier sowing, however this commonly results in excess vegetative growth and crop lodging. The effects of a range of plant growth regulators on plant growth and alkaloid yield of thebaine poppies were evaluated in three preliminary field trials conducted in northern Tasmania from 2002 - 04. Application of Slow Grow (maleic hydrazide) reduced seed weight in most trials and this result is potentially beneficial to industry as thebaine poppy seed is of limited commercial value due to thebaine residues. Application of Moddus (trinexapac) and Sunny (uniconazole) showed the greatest potential by altering alkaloid profile and reducing plant height respectively.

In a subsequent field trial with morphine poppies, single and split applications of Sunny across three growth stages were compared and while plant height was reduced, effects on plant lodging were inconsistent. Whereas lodging was decreased with the split application, the single application increased lodging, perhaps a result of the large height difference between main stem and lateral capsules. The split application of Sunny also resulted in a greater capsule yield compared with single and nil treatments through increased capsules/m². Despite a reduction in individual seed weight, seed yield from Sunny treatments was also greater due to a large increase in the number of seeds per capsule. It is proposed that the reduction in plant height and lodging with application of Sunny leads to reallocation of assimilates to yield components. Alkaloid content, in particular morphine, was also increased with application of Sunny and this is likely to be a result of extended alkaloid biosynthesis through delayed maturity.

The alkaloid, thebaine, is of higher value than oripavine and application of Moddus in three additional rate and timing trials consistently increased thebaine content. Associated with this, oripavine content decreased and this effect was rate responsive. In contrast with Sunny, Moddus had little effect on plant height or maturity. Instead, seed yield was reduced and straw yield tended to increase and combined with alkaloid effects, this consistently increased thebaine yield around 25%. Multiple and split

applications of Moddus tended to further increase thebaine content. As total alkaloid did not vary with single applications, it was postulated that Moddus inhibits the biosynthesis of oripavine from thebaine.

Results from this study and further trials conducted by industry have led to the registration of Moddus on poppy crops and close to 100% adoption rates by thebaine poppy growers. The potential of Sunny as a plant growth regulator (now marketed as Sumagic) has also been verified and in addition the benefit of split applications of both Sunny and Moddus demonstrated.

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In many ways this was an example of how not to do a higher degree: start later in life; attempt to do it while actively working and completely change topics after 5 years! However after a number of years this stage of my life is completed and no one will be more happy than my wonderful wife Jo (who I thank for her understanding and my reduced household chores) and my two lovely boys Jack and Laurie who will see more of their father and who may find they can now be noisier before bedtime.

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