Mapleton Agri Biotec Pty Ltd

FOUR GOOD REASONS TO USE TwinN™ IN BLUEBERRIES

TwinN is an Australian made freeze-dried microbial inoculum. It is used in broadacre production and in many tree and vine crops in Australia and overseas. A trial result from blueberries in Chile is included below. TwinN is produced in an Australian fermentation factory and every batch is tested for correct numbers of each microbe species by AIRG, a NSW Government laboratory. It is used in blueberries to increase yields and increase quality after storage. TwinN is used by conventional and organic producers.

1. IMPROVE CROP NUTRITION

- **TwinN** microbes colonise the roots and shoots and provide a steady supply of nitrogen to the crop by fixing N_2 from the air into **NH_3**, plant available ammonium nitrogen, for the crop ($N_2 + 8H^+ + 6e^- \rightarrow 2\,NH_3 + H_2$)

Shoot measurement in a Blueberry trial in Chile.

- **TwinN** increases root growth and efficiency so N fertiliser and other nutrients are captured more efficiently

Blueberries have low nitrogen requirements but they do need adequate N to drive shoot growth for next year's crop. TwinN helps to provide sufficient N to allow enough new canes and strong growth of new shoots (see trial result). The steady supply of N via TwinN avoids excessive shoot growth at the expense of fruiting. TwinN microbes supply N in ammonium form which suits blueberries well as they do not utilise nitrate N efficiently.

In addition to providing nitrogen nutrition, TwinN improves overall crop nutrition by improved root growth and by assisting in building up a healthy microflora in the root zone which improves the availability of micronutrients.

2. IMPROVED ROOT DEVELOPMENT

TwinN microbes produce plant growth factors, including auxins that increase root growth and efficiency of nutrient capture. This enables good yield improvements in blueberries that often have shallow root systems and lack root hairs. TwinN is used by many tree crop producers to assist in management of root diseases. This works via interactions with other microbes (see below) but also by the stimulation of recovery growth in roots after pathogen damage.

Note the excellent secondary root development in TwinN blueberries grown in Chile.

3. IMPROVED SOIL MICROFLORA

Soil micro-organisms are a key part of soil health. They contribute to nutrient cycling and a balanced microflora will assist in reducing disease pressure from soil pathogens. Some agrochemicals and fertilisers have very bad effects on beneficial microbes, and soil-borne diseases can be the result. Studies by scientists at the USDA in Illinois of the effects of TwinN on soil microflora around roots of soybean and maize found that TwinN increased beneficial microbes associated with micronutrient availability and suppression of soil pathogens. This led to a measurable decrease in Fusarium infection of roots. TwinN is used by avocado and citrus growers as part of an integrated management strategy to suppress Phytophthora problems.

4. IMPROVED SHELF LIFE AND STORAGE CAPACITY

The nitrogen nutrition profile supplied by TwinN results in fruit that are firmer, less prone to spoilage by disease during storage, and have a higher capacity to retain quality and marketability during storage. Please refer to the trial by Driscoll's in Chile that is included below.

RECOMMENDATIONS FOR USE OF TwinN IN BLUEBERRIES

Application method: TwinN is usually applied via the drip irrigation system in blueberries. It is not applied in the same tank mix with agrochemicals or fertilisers. Once the microbes have been applied they colonise the roots and also move up into the entire plant where they live as endophytes.
Timing: TwinN is applied at the start of spring growth and then again after harvest to drive strong shoot growth for next seasons harvest (see trial results, below). In some production areas (eg Chile) TwinN is also applied early in fruit development.
Nitrogen fertiliser applications:
1. In high yielding crops that apply moderate to high N fertiliser rates, apply TwinN and reduce N fertiliser rates by 40%. Make the reductions evenly to the N program across the season. Do not cut other nutrients.
2. For low yielding crops, or newly planted/young crops that need improvement, apply TwinN and keep the fertiliser program at standard levels until soils and yields have stabilised at the desired level.
3. For organic growers, use TwinN in combination with other organic nutrient supplies.

TwinN trial in blueberries, Region Zonal VIII, Chile

A trial was performed in 2013 by Driscoll's de Chile S.A. in collaboration with AMecological, a distributor of agricultural products, including TwinN, in Chile. The trial aimed to test the effectiveness of TwinN in stimulating growth of shoots for fruit production and to determine the extent that TwinN produced blueberries could be stored for longer periods without loss of quality. This was important to Driscoll's as they export blueberries to the USA and also to allow storage to extend the market season.

Treatments

Conventional: 40 UN in spring and late summer/autumn
TwinN: 40 UN in spring and late summer/autumn, TwinN in spring via drip irrigation
Site: Commercial blueberry farm, Zonal VIII, Chile. TwinN treated area 0.95 ha. Tumao deep soil with slight compaction at 40cm. Cv Duke. Planted 2006. Av. yield 10 – 11 T/ha.

Key Results

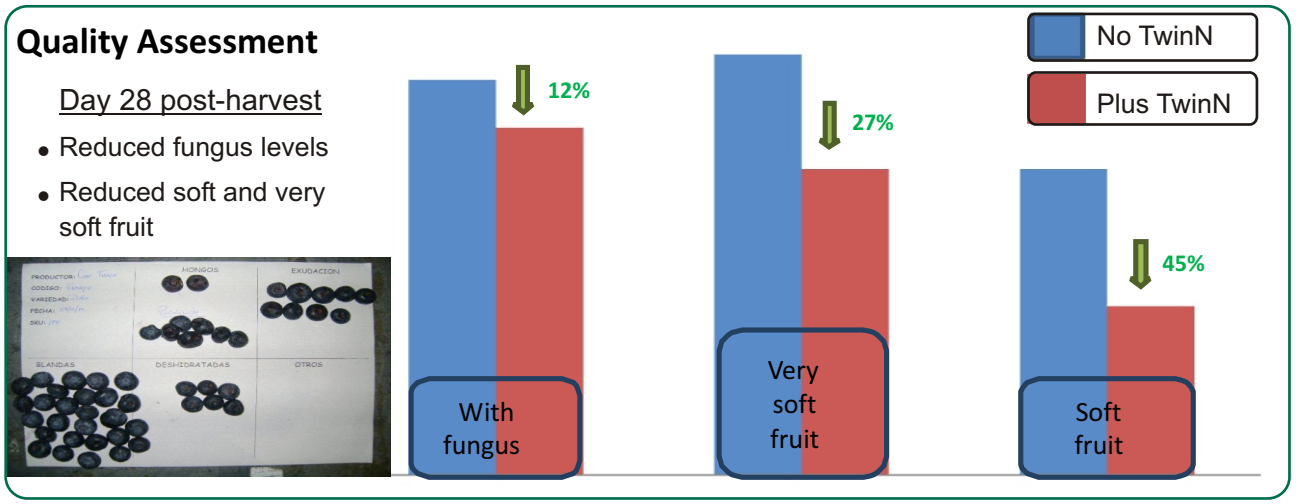
- TwinN treated plants produced a large increase in both the number and vigour of new shoots that farm managers expected to produce high yields in the next fruit season
- TwinN treated plants produced fruit that had significantly enhanced quality after four and six weeks storage compared to the conventional program.

Result: A single application of TwinN at the start of the growing season produced a approximately double the number of new shoots compared to the standard farm program. The growth of these buds was 50% greater than the untreated controls. Fruit yields were not significantly increased in TwinN crops and this was expected since they are largely determined by previous years shoot growth. The following years yields were expected to be high based on the state of the plants at the seasons end.

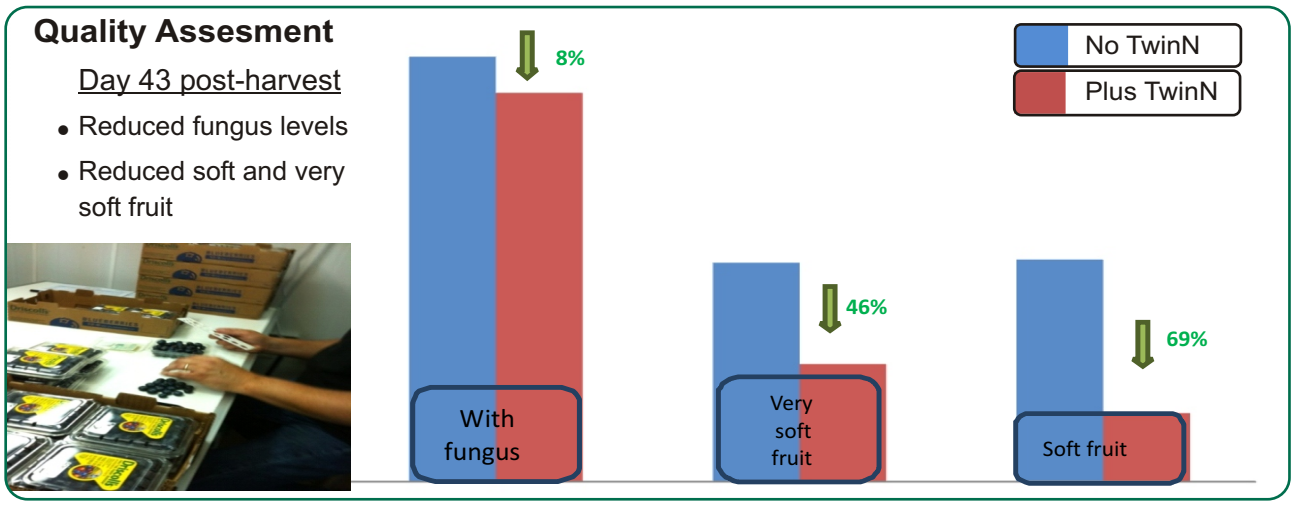
On the basis of this result, plus other commercial applications of TwinN, the farm managers concluded that the commercial program (see below) recommended by AMecological would be adopted. This included more TwinN applications combined with a 40% decrease in N rates.

Crop Vigour Measurements		
	Number of shoots per year	Length of apical buds (cm)
With TwinN	**126.4**	**54.2**
No TwinN	**62.4**	**36.2**
Crop History: Planted 2006 (7 years old). Average yield 10-11 tons/yr		

Table 1: Crop Vigour measurement with and without TwinN



Fruit quality assessment at Day 28 after harvest showing TwinN substantially improved fruit quality after 28 days storage



Fruit quality assessment at Day 43 after harvest showing TwinN substantially improved fruit quality after 43 days storage

Result

The quality improvement from TwinN treated plants was substantial. Rates of fungal spoilage were reduced by 12% at 4 weeks and 8% at 6 weeks after harvest. The proportions of soft and very soft fruits were significantly reduced at 4 weeks and greatly reduced at 6 weeks after harvest. This is of significant value to the marketing company and their farmers.

Conclusion

The increase in vigour was large and the next seasons applications will follow the standard commercial recommendation from AMecological for existing productive soil and healthy crops. This is a 40% reduction in N from 40 U/ha to 24 U/ha in two applications. This is supplemented with three applications of TwinN.

Application 1 Start of spring growth to get strong shoot growth and fruit initiation

Application 2 Early fruit growth to assist good fruit growth and high brix

Application 3 Post harvest to set up the shoots for next seasons harvest

This program is designed to obtain high vigour of shoot growth but uses a reduced N rate to prevent excessive vegetative growth. Reduced N and more TwinN applications assist in maximising fruit quality and storage capacity.

OTHER PRODUCTS YOU MAY BE INTERESTED IN TRYING FOR BLUEBERRIES AND OTHER FRUIT TREES.

NitroGuard™

NitroGuard is TwinN plus additional *Bacillus* species. NitroGuard provides all the benefits of TwinN and the additional *Bacillus* species have been added to enhance the effects TwinN has in increasing beneficial microbes in the root zone and reducing the effects of some root pathogens on tree and vine crops. It is often used for this purpose by avocado, citrus and other fruit tree growers in Australia, Chile, North America and some European countries.

CataPult™

CATAPULT
RELEASE & CATCH TECHNOLOGY™

CataPult is a new product. CataPult used a unique combination of *Bacillus* species and a beneficial VAM fungus. The *Bacillus* species:

- Assist in combatting root infections
- Strongly stimulate root growth
- Solubilise bound phosphorous (RELEASE)

VAM are vesicular arbuscular mycorrhizae and blueberry plants are extremely responsive to VAM. Since they have no root hairs and a weak root system VAM's capacity to form a large network of hyphae that scavenges nutrients and delivers them to the roots (CATCH) is very effective in blueberries. In very healthy soils with limited agrochemical inputs blueberry plants will always have a natural VAM system in place. But in modern agricultural production and in poor soils CataPult can be applied once per year to healthy crops, or more frequently in less healthy crops, to ensure high numbers of VAM and *Bacillus* are present. VAM also provide enhanced capacity to find water beyond the limited root zones found in many blueberry crops. This can assist resilience to dry spells. CataPult can be applied to the planting hole new plantings in granular form or via drip irrigation to any stage of the crop.

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