

## **REPORT OF ALMOND TRIALS**

### **2007-2008 SEASON**

### **NORTHERN ADELAIDE PLAINS**

**INTRODUCTION:** The trials were established to demonstrate the efficacy of two products.

- 1) FULZYME-plus (BACILLUS SUBTILIS)
- 2) KELPAK (SEAWEED EXTRACT)

ZADCO PTY LTD are the distributors of Fulzyme-plus. According to ZADCO the product will prevent infections of Pythium and or Phytophthora on plant roots. In almonds, particularly the stock Nemaguard and bitter almond are most susceptible to both pathogens.

In the early 90's most established almond orchards in the Northern Adelaide plains were on Nemaguard or almond rootstocks. The low yields and the early (January) defoliation of the trees reflected the lack of feeding roots which were partly reduced by Pythium. The reduction of fibrous roots were contributed to high Na (Sodium) and Cl (Chloride) levels, partly in irrigation water and partly naturally occurring in the soil.

The Sodium and Chloride problems were considerably reduced by the change of management systems. The Pythium problems were reduced by Phosphonic acid applications in the growing season, however it was not a complete solution to the problem.

AGRICHEM PTY LTD is the distributor of Kelpak. The claim of the producers of Kelpak is that by applying the product at certain growth stages to almonds, it will produce higher fruit set, hence higher yield in almonds and better retention of fruit during the growing period.

In theory, the combination of Fulzyme-plus and Kelpak should be complimentary. The Fulzyme-plus application should ensure a more robust feeding root system. The Kelpak application should improve fruit set and yield. The better root establishment and root retention during the season should enable the trees to carry the higher yield produced by the Kelpak application. Kernel size and kernel density will be assessed to evaluate percentage "crack-out" and size distribution.

#### **TREATMENTS:**

- 1) KEANE ALMONDS
  - Fulzyme-plus  
1st application: 1 Litre/Ha - 9th September 2007  
2nd application: 1 Litre/Ha - 11th October 2007
  - Kelpak  
1st application: 3 Litres/Ha - 14th August 2007  
2nd application: 3 Litres/Ha - 28th August 2007
- 2) SHARPE ALMONDS
  - Fulzyme-plus  
1st application: 1 Litre/Ha - 27th August 2007  
2nd application: 1 Litre/Ha - 28th September 2007
  - Kelpak  
1st application: 3 Litres/Ha - 17th August 2007  
2nd application: 3 Litres/Ha - 7th September 2007
- 3) AJS PIERSON & SON P/L
  - Fulzyme-plus  
1st application: 1 Litre/Ha - 9th September 2007  
2nd application: 1 Litre/Ha - 11th October 2007
  - Kelpak  
1st application: 3 Litres/Ha - 19th August 2007  
2nd application: 3 Litres/Ha - 5th September 2007

THE VARIETY USED IN THE TRIAL WAS NON-PAREIL.

## **METHOD OF APPLICATION:**

### **A) FULZYME-plus**

The application of Fulzyme-plus was made by fungigation (irrigation).

- 1) Keane Almonds: micro-sprinklers, tree line irrigation.
- 2) Sharpe Almonds: subterranean drip, 2 lines / row, pulse.
- 3) AJS Pierson & Son: low-throw sprinklers, total orchard floor cover.

### **B) KELPAK**

The application of Kelpak was made by TURBO-BLAST, BY-PASS sprayer unit at 1000 Litres of water / Ha in each trial. Water pH varied from 6.9 - 7.1.

## **VISUAL OBSERVATIONS AND ASSESSMENTS:**

### **A) TREE VIGOUR:**

1) FULZYME-PLUS: Observations and assessment of tree vigour were made mid October and mid November. The mid October observation showed only normal growth pattern compared to control. The mid November observation showed better shoot growth and deeper leaf colour compared to control. The number of new shoots on treated trees was very obvious.

2) KELPAK: The mid October observation showed only normal growth pattern with noticeably better fruit set on the treated trees compared to control. The mid November observation showed better foliage colour and noticeable larger leaves on treated trees compared to control.

3) FULZYME-PLUS + KELPAK: The mid October observation showed much deeper leaf colour, better shoot growth and a very heavy fruit set on the treated trees as well as larger very healthy leaf structure. The mid November observation showed that this treatment is superior in every way to all other treatments. Very heavy set of fruit, very healthy growth pattern, no loss of fruit, good fruit retention.

### **B) ROOT DENSITY ASSESSMENT:**

In this assessment a 10 cm diameter soil auger was used. Three depths were assessed, 0-20 cm, 20-40 cm, 40-60 cm. Ten trees of each treatment were selected at random. At each of the three sites, five auger tests were made, 120 cm away from the main trunk of the tree. This assessment was made in early November. A rating of 5 categories were set up to measure the root density in each treatment.

- 1 = no feeding roots at all depths
- 2 = trace of feeding roots at all depths
- 3 = some feeding roots at 0-20 cm
- 4 = acceptable level of feeding roots at 0-20 cm & 20-40 cm
- 5 = good level of feeding roots at 0-55 cm

- 1) FULZYME-PLUS: On all Fulzyme-plus trees assessed, the rating was 4 - feeding roots were present down to 40 cm.
- 2) KELPAK: The Kelpak treated trees assessed, ranged between the 3 - 4 rating.
- 3) FULZYME-PLUS + KELPAK: The Fulzyme-plus + Kelpak treated trees showed the highest density of feeding roots. The rating was between 4 - 5.
- 4) CONTROL: The untreated trees showed feeding roots at the 0-20 cm depth, the density rating at this depth is 2 - 3. The density of feeding roots at 20-40 cm was insignificant.

### **ROOT RETENTION ASSESSMENT:**

Hydraulic backhoe (width - 800 mm) was used to make a trench 1.2 m from the trunk of the tree. The trench size was 1m length x 0.7 m depth x 0.8 m width. The trees were chosen by the grower in each treatment to avoid biased selection by the assessor. After the trench had been dug, a high pressure hose was used to expose the root profile.

Progress report on this assessment was sent with photographs enclosed of each treatment on the 15th January, 2008. SARDI diagnostic report was sent on the 25th January, 2008. ( This report needs correction regarding the treatments).

## FRUIT SET ASSESSMENT (VISUAL):

TRIAL SITE - AJS PIERSON & SON P/L (NEMAGUARD & ALMOND STOCK)

FULZYME-PLUS: There was no measurable difference between treated and untreated trees. There was a light shedding of fruit in the 3rd week of November.

FULZYME-PLUS + KELPAK: The fruit set in this treatment is outstanding, there is 10% - 15% higher fruit set in all the treated trees. There was no loss of set to shedding in this treatment, fruit retention was excellent.

KELPAK: The fruit set in this treatment is good, however it was not as heavy as in the Fulzyme-plus + Kelpak treatment. Estimated 8% - 10% higher fruit set was observed in this treatment compared to the untreated trees.

CONTROL (UNTREATED): The control trees showed a consistently lower number of fruit set. All control trees showed light shedding of fruit in the 3rd week of November.

All treatment results will be confirmed by the yield assessment.

TRIAL SITE - SHARPE ALMONDS (HYBRID STOCK)

FULZYME-PLUS: In this treatment, the trees had visible stronger shoot growth, higher number of shoots per tree, than the control trees. The foliage on the treated trees was 20% higher, had better leaf colour and larger leaf size.

FULZYME-PLUS + KELPAK: In this treatment the fruit set is excellent. There is a 25% - 30% increase in the number of fruit on the treated trees compared to the control. The general health of the treated trees is very good compared to the untreated.

KELPAK: In this treatment the fruit set is 15% - 20% higher than the control trees. The general health of the trees is good, however not as good as in the Fulzyme-plus + Kelpak treatment. The shoot growth is not as vigorous, leaf colour is lighter.

CONTROL: The control trees have a reasonable fruit set, however the general appearance of the trees is not as prolific as the treated trees.

TRIAL SITE - KEANE ALMONDS (HYBRID STOCK)

FULZYME-PLUS: In this treatment the trees had stronger shoot growth, 20% higher number of shoots per tree than the control trees. The treated trees have 20% higher foliage area, better leaf colour and larger leaves.

FULZYME-PLUS + KELPAK: In this treatment the fruit set was outstanding. There is a 30% - 38% increase in the number of fruit on the treated trees compared to the control.

KELPAK: In this treatment the fruit set is 15% - 20% higher, compared to the control. The general health of the trees in the treatment is good, however not as good as the Fulzyme-plus + Kelpak treatment. The shoot growth is not as vigorous, leaf colour is lighter.

CONTROL: In this trial, the control trees have a reasonable fruit set, however the general appearance of the trees is not as prolific as the treated trees.

### YIELD:

TRIAL 1 - KEANE ALMONDS - TABLE 1:

| TREATMENT                | BULK WEIGHT /<br>Ha<br>IN Kg | HULL + SHELL<br>WEIGHT / Ha IN<br>Kg | KERNEL<br>WEIGHT / Ha<br>IN Kg | % YIELD<br>INCREASE |
|--------------------------|------------------------------|--------------------------------------|--------------------------------|---------------------|
| FULZYME-PLUS             | 9750                         | 7000.5                               | 2749.5                         | + 15.1              |
| KELPAK                   | 11650                        | 8330                                 | 3320                           | + 39.0              |
| KELPAK<br>+ FULZYME-PLUS | 12650                        | 8919                                 | 3731                           | + 56.3              |
| CONTROL                  | 8875                         | 6488                                 | 2387                           |                     |

TABLE 2: KERNEL % OF “CRACK-OUT” / TREATMENT

50 whole almonds were collected from each treatment to determine the % of “crack-out”.

| TREATMENT                | WEIGHT OF WHOLE ALMOND IN GRAMS | WEIGHT OF HULL + SHELL IN GRAMS | WEIGHT OF KERNEL IN GRAMS | % “CRACK-OUT” |
|--------------------------|---------------------------------|---------------------------------|---------------------------|---------------|
| FULZYME-PLUS             | 230                             | 155                             | 65                        | 28.2          |
| KELPAK                   | 245                             | 175                             | 70                        | 28.5          |
| KELPAK +<br>FULZYME-PLUS | 220                             | 155                             | 65                        | 29.5          |
| CONTROL                  | 230                             | 170                             | 62                        | 26.9          |

TABLE 3:

50 kernels were graded into size as follows: 18-20 = Large, 22-24 = Medium, 26-28 = Small.

| TREATMENT             | 18-20 IN % | 22-24 IN % | 26-28 IN % |
|-----------------------|------------|------------|------------|
| FULZYME-PLUS          | 14         | 42         | 44         |
| KELPAK                | 14         | 40         | 46         |
| KELPAK + FULZYME-PLUS | 26         | 28         | 46         |
| CONTROL               | 10         | 26         | 64         |

The above table (table 3) clearly shows the influence of Fulzyme and Kelpak’s enzyme and hormone exchange capacity. It also shows the influence on kernel size by both products.

TRIAL 2 - SHARPE ALMONDS:

The yield results in this trial reflects the uneven tree size in the trial plots, consequently the results are variable and only partly conclusive. Kernel density was the same in both Trial #1 and Trial #2 (TABLE 2, above).

TABLE 1: YIELD

| TREATMENT                | BULK WEIGHT / Ha IN Kg | HULL + SHELL WEIGHT / Ha IN Kg | KERNEL WEIGHT / Ha IN Kg | % YIELD INCREASE |
|--------------------------|------------------------|--------------------------------|--------------------------|------------------|
| FULZYME-PLUS             | 9700                   | 6965                           | 2735                     | - 1.8            |
| KELPAK                   | 10650                  | 7615                           | 3035                     | + 9.0            |
| KELPAK +<br>FULZYME-PLUS | 10500                  | 7676                           | 2824                     | + 1.0            |
| CONTROL                  | 9450                   | 6662                           | 2788                     |                  |

TABLE 2 - SHARPE ALMONDS

50 kernels were graded into size as follows: 18-20 Large, 22-24 Medium, 26-28 Small.

| TREATMENT             | 18-20 IN % | 22-24 IN % | 26-28 IN % |
|-----------------------|------------|------------|------------|
| FULZYME-PLUS          | 16         | 40         | 44         |
| KELPAK                | 13         | 46         | 41         |
| KELPAK + FULZYME-PLUS | 22         | 31         | 47         |
| CONTROL               | 11         | 38         | 51         |

**SUMMARY:**

The three trial sites, have produced results to support the claim for FULZYME-PLUS in allowing good fibrous root development and retention of the developed fibrous roots.

As shown in the photos, FULZYME-PLUS assisted greatly in the establishment of good root density as well as the depth of fibrous root development (40 cm - 55cm).

The timing of FULZYME-PLUS application needs further investigation to maximize the effect of its application.

The claim of higher yields by KELPAK was proven by Trial # 1 (Keane) and Trial # 2 (Sharpe). Unfortunately, the Trial # 3 site (Pierson) has not given yield data, however the root assessment data was very important in this trial site. Nemaguard was the rootstock and both FULZYME-PLUS and the combination of FULZYME-PLUS + KELPAK applications have proved the efficacy of both products.

The growers have attended two field days and are convinced of the usefulness of the products.

Further trials will be conducted in the 2008-2009 season by growers and Sustainable Horticultural Services. The 2008-2009 trials will be funded by the growers and Sustainable Horticultural Services.

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SHS