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DRY LAND WHEAT TRIAL 2007

Soil microbial life in dry land wheat areas is notoriously low which has a detrimental impact on production volumes and input cost. Furthermore many pest and disease problems, like snails and slugs, can be attributed to dead soil. In these soils there are not enough predators to keep pest populations low. By adding beneficial soil organisms, soil life can be restored and the benefits of a healthy soil realised. In 2007 a trial was conducted near Bredasdorp where 30L Compost Tea, 0.5L Kelpak and 1L fish emulsion were applied per hectare. The solutions were sprayed directly onto the seed when planted with a minimum-till planter. No production increases were found, but the protein levels in the wheat were 0.7% higher, which led to higher grading and a net profit increase of R130/ha. The size of the compost tea system was the determining factor in the decision to apply only 30L of Compost Tea per hectare. It was then decided to double the capacity of the compost tea system and to apply more compost tea per hectare and also develop a potent microbial food additive that would increase the microbial numbers in the soil.

DRY LAND WHEAT TRIAL 2008

Introduction

At the beginning of 2008 Ecosoil developed and tested a new product called Apex which is specifically designed for dry land applications. Due to the vast areas planted per day and the production constraints of the Compost Tea system, relatively small amounts of Compost Tea can be applied per hectare. Apex is applied with the Compost Tea and serves as a food source to multiply these micro-organisms in the soil. During 2008 two new trials were statistically designed and planted on 26 May 2008 to test the effect of Apex together with Compost Tea on wheat growth and production. The minimum till planter was rigged with two 500L tanks for the Compost Tea and a 100L tank for the Apex (Picture 1). The Compost Tea was applied with a diaphragm pump calibrated at 60L/ha. The Apex was applied using a Dosatron pump (Picture 2) set at 10% (6L/ha) delivery.



Picture 1 - Minimum till planter rigged with two 500L tanks for Compost Tea and a 100L tank with Dosatron pump for the Apex.



Picture 2 - Dosatron pump set at 10% with 100 L tank for the dosing of the Apex



Picture 3 - Compost Tea and Apex is dosed directly onto the seed as it is planted. The thin jet of Compost Tea can be seen just left from the yellow seed nozzle. The yellow nozzle on the right is for fertiliser application

Statistical procedures

Two randomised complete block design (RCBD) trials were conducted. Each trial consisted of 5 treatments randomly assigned to each of the 4 block replications. An experimental unit was a 7.2 m x 50 m plot from which 3 or 4 sub samples of size 14m² were randomly taken from trial 1 and 2, respectively. The data measured at harvest was Yield in kg per plot, Yield in ton per ha, Hectoliter Weight, Percentage Moisture, Percentage Protein and the grading. All the data was subjected to an appropriate analysis of variance (ANOVA) using SAS statistical software. Shapiro-Wilk's test was performed on the standardized residuals to test for deviations from normality. For both trials and variables there were no evidence against normality therefore the data are considered as statistical reliable. Pair wise T-test was performed on the least square means and the exact probabilities of difference was calculated. Probabilities less than 0.05 are considered significant. Student's t-LSD (Least significant difference) was also calculated at a 5% significant level to compare treatment means.

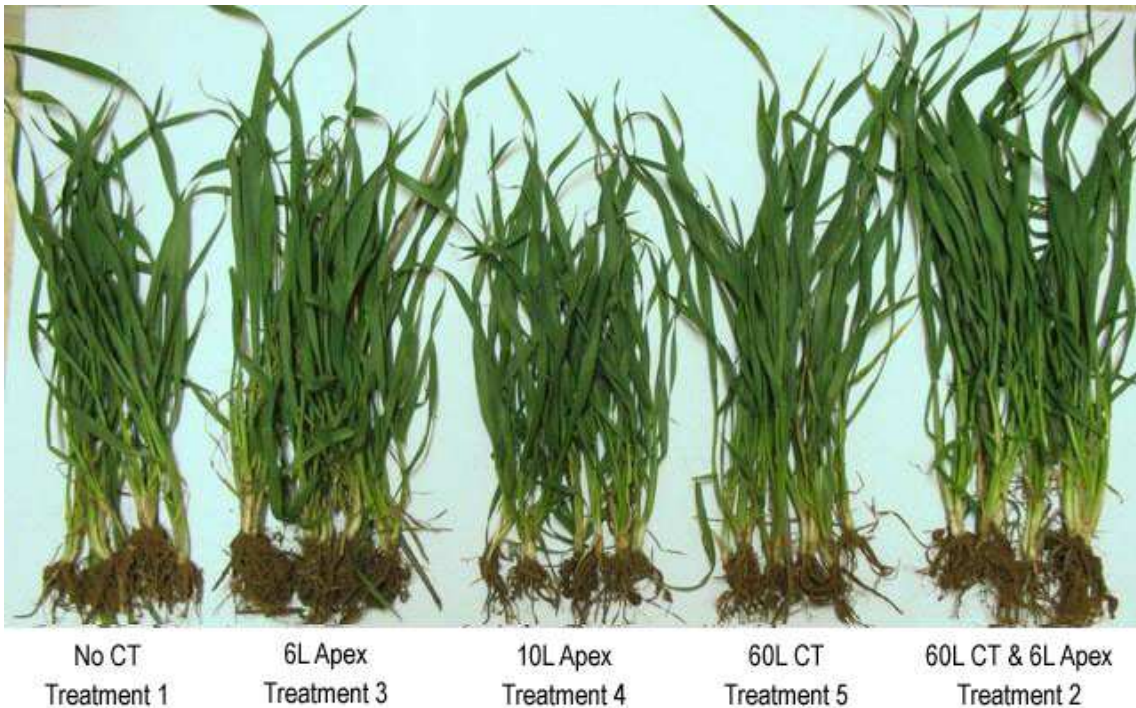
Trial 1: The effect of Compost Tea and Apex on production volume and quality of dry land wheat when applied in combination or separate.

Treatments

The fertiliser used in all treatments was 30 kg urea with organic acids (a commercial product). The five treatments were:

1. Control – no Compost Tea or Apex
2. 60L Compost Tea and 6L Apex
3. 6L Apex
4. 10L Apex
5. 60L Compost Tea

Results and discussion



Picture 4 - The effect of the different treatments on growth.
Samples were taken on 24th July 2008 (8.5 weeks after planting).

As can be seen in picture 4, treatment 2 (far right) showed a far better growth than the control (far left). Treatments 3 and 5 also showed a positive effect on growth. Treatment 4 (10L Apex) showed a negative growth effect, confirming earlier tests that we did. Apex when used at lower dosages will increase growth, but at higher dosages will have a negative effect. The combination of Compost Tea and Apex had the best effect. This was the standard treatment that was done on the entire farm.



Picture 5 - The harvester that was used

Table 1 - Summary of data from trial 1

Treatment No	Treatments	Ton/ha	% Change	Hectolitre weight	Moist	Prot %	Grade
1	Control - no Compost Tea, no Apex	2.83 a		76.00 a	14.59 a	12.56 b	B2 a
2	60L Compost Tea + 6L Apex	3.24 a	14%	75.88 a	14.33 ab	13.08 a	B3 a
3	6L Apex	3.04 a	7%	75.00 a	14.45 ab	12.77 ab	B3 a
4	10L Apex	2.82 a	-2%	75.25 a	14.32 ab	12.78 ab	B3 a
5	60L Compost Tea	2.88 a	2%	75.75 a	14.25 b	12.53 b	B3 a
	Least Significant Difference (LSD)	0.62		1.39	0.32	0.5	

Note: Means with same letters in a column do not differ statistically

Treatment 2 showed a 14% increase in production over the control, although not significant at the 5% significant level. This was due to the high degree of variance that occurred between the 4 replications. The difference in production between treatment 1 and 2 was 0.41 ton/ha and needed to be 0.62 ton/ha to be statistically significant different at a 5% significant level. The pair wise probability was 0.18 (risk factor of 18%) to be statistically significant. In laymen's terms, this means that there is an 82% chance that treatment 2 will lead to increased production over the control.

The protein content of treatment 2 was significantly higher than the control. The wheat was harvested late in the season after a period of heavy rain, which had a detrimental impact on the grade. Grain harvested prior to the rain on the rest of the farm graded B1. They received treatment 2 as standard.

The results of this trial suggest that the use of Compost Tea and Apex had a statistically significant positive effect on quality (higher protein content) and also showed a 14 % increase in production. However this increase was not high enough to be statistically different. The use of Compost Tea and Apex also increased root growth, which will be an added benefit in times of drought. A gradual build-up of micro-organisms will occur when applied every year at planting. When this happens, it can be expected that stubble will break down more quickly thus increasing soil organic matter content. As micro-organism numbers and diversity increase, less pest and disease will occur.

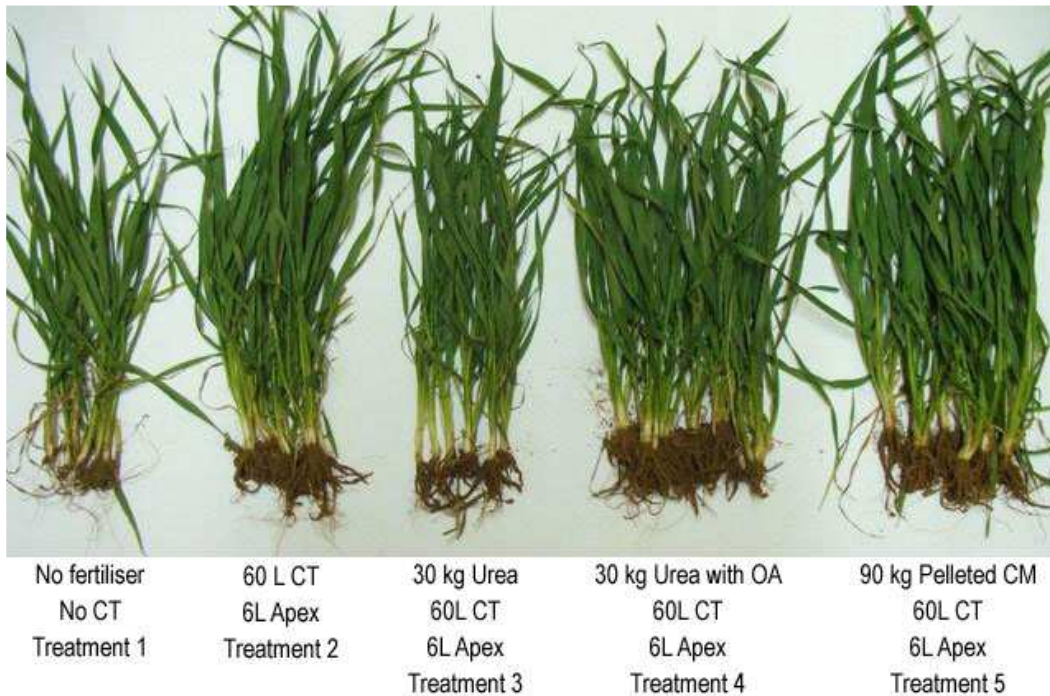
Trial 2: The effect that different fertilisers have in combination with Compost Tea and Apex on production volume and quality of wheat

Treatments

Four replications of the following 5 treatments were done:

1. No fertiliser or Compost Tea
2. 60L Compost Tea and 6L Apex
3. 30 kg Urea, 60L Compost Tea and 6L Apex
4. 30 kg Urea with organic acids (a commercial product), 60L Compost Tea and 6L Apex
5. 90 kg pelletized chicken manure (a commercial product), 60L Compost Tea and 6L Apex

Results and discussion



Picture 6 - The effect of different fertilisers, Compost Tea and Apex on growth of wheat. These samples were taken on 24th July 2008 at 8.5 weeks after planting.

From picture 6 it is clear that treatments 4 and 5 had a greater effect on growth than the other treatments. Compared to the control (far left), the Urea with Compost Tea and Apex (middle – treatment 3) had similar growth and root development. The application of Compost Tea and Apex without any fertiliser (Treatment 2) also had a positive affect on growth over the control.

Table 2 - Summary of data from trial 2

Treatment No	Treatments	Ton/ha	% Change	Hectolitre weight	Moist	Prot %	Grade
1	Control - No Fertiliser, CTea or Apex	3.12 c		75.38 a	14.13 b	12.78 a	B3 a
2	Only 60L Compost Tea and 6L Apex	3.21 abc	3%	75.62 a	14.34 a	12.39 a	B3 a
3	30kg Urea + 60L CTea + 6L Apex	3.07 c	-2%	76.00 a	14.23 ab	13.54 a	B2 a
4	30kg Urea with OA + 60L CTea + 6L Apex	3.46 a	11%	76.00 a	14.21 ab	12.53 a	B2 a
5	90kg CManure + 60L CTea + 6L Apex	3.41 ab	9%	76.25 a	14.16 b	12.91 a	B2 a
	Least Significant Difference (LSD)	0.32		1.22	0.17	1.19	

Note: Means with same letters in a column do not differ statistically

Treatment 4 and 5 showed a statistical significant increase in production over the control. Treatment 4 showed an 11% increase and treatment 5 a 9% increase in production over the control. Between treatment 4 and 5 there were no statistical difference in production. Treatment 3 showed no significant difference and was actually 2% less than the control. After emergence the young seedlings looked stunted and it is postulated that the urea might have burnt the young seedlings and may also have killed the micro-organisms in the Compost Tea. The urea with organic acids did not show this effect. With treatments 3 and 4 12 kg/ha nitrogen (N) was applied. With treatment 5 only 2.3 kg N/ha was applied. This makes the result of treatment 5 even more impressive.

There was no statistical difference in protein content and grade between the different treatments.

From the results of this trial it can be stated that the type of fertiliser does have an impact on production irrespective of the amount of nitrogen applied. The effect that different fertilisers have on the microbial community must also be looked at further.