TWINN CROP TRIAL

Wheat: West Cape, South Africa, 2009

An independent replicated trial was performed to quantify the efficacy of TwinN on winter wheat under dryland, winter rainfall conditions in West Cape, South Africa.

KEY RESULTS

- The trial site showed a very strong nitrogen (N) response.
- Addition of TwinN to plots receiving only 25% of N fertiliser gave a significant yield increase (+53%).
- Addition of TwinN to plots receiving only 50% of N fertiliser gave a significant yield increase (+39%).
- Addition of TwinN to plots receiving only 50% of N fertiliser produced a yield that was statistically equal to the 100% N treatment.
- Addition of TwinN at x2 concentration did not significantly change yield compared to x1 concentration.
- Addition of TwinN to plots receiving only 50% of N fertiliser decreased the carbon footprint per ton of yield by 25% compared to the 100% N treatment with no TwinN.

TREATMENTS

Description	Basal Fertiliser	Topdress/TwinN Wk 5	TwinN Wk 9	Synthetic N/ha
1. 100% fertiliser control	100 kg/Ha MAP, 175 kg/Ha LAN, 60 kg Kcl	107 kg/ha LAN	107 kg/ha LAN	120
2. 0% of standard	-	-	-	0
3. 25% of standard	100 kg/Ha MAP, 68 kg/Ha LAN, 60 kg KCl	-	-	30
4. 25% + TwinN x 1	100 kg/Ha MAP, 68 kg/Ha LAN, 60 kg KCl	TwinN normal rate	TwinN normal rate	30
5. 25% + TwinN x 2	100 kg/Ha MAP, 68 kg/Ha LAN, 60 kg KCl	TwinN double rate	TwinN double rate	30
6. 50% of standard	100 kg/Ha MAP, 175 kg/Ha LAN, 60 kg KCl	-	-	60
7. 50% + TwinN x 1	100 kg/Ha MAP, 175 kg/Ha LAN, 60 kg KCl	TwinN normal rate	TwinN normal rate	60
8. 50% + TwinN x 2	100 kg/Ha MAP, 175 kg/Ha LAN, 60 kg KCl	TwinN double rate	TwinN double rate	60

Half a ton of calcitic lime/ha was applied across the trial site.

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TRIAL RESULTS

Yields and carbon footprints for different combinations of TwinN and N fertiliser rates

TREATMENT	Yield (T/ha)	Yield Difference[a] (kg and %)	Carbon Footprint[#] kg(CO_2e)/T yield
T1 100% N (120 kgN/ha)	2.66	-	1140
T2 0% N	0	Control for 0% N	-
T3 25% N	1.03	Control for 25% N	980
T4 25% + 2 TwinN (1x conc)	1.58	+53% (550 kg/ha)	703
T5 25% + 2 TwinN (2x conc)	1.71	+66% (680 kg/ha)	660
T6 50% N	1.77	Control for 50% N	1180
T7 50% + 2 TwinN (1x conc)	2.46	+39% (690 kg/ha)	870
T8 50% + 2 TwinN (2x conc)	1.95	+11% (190 kg/ha)	1066

a: Percentage yield difference compared to the same N application rate without TwinN.
LSD ($p<0.5$) for yield = 550 kg. Yield differences of less than the LSD are not statistically different.

#The relative carbon emissions for each treatment have been determined utilising The Renewable Fuels Agency's Carbon Calculator. The measurement is as CO_2 equivalents per tonne of yield. Assumptions are that all N fertiliser was applied in one pass, and that TwinN required an additional pass over the paddock. Calculations have included TwinN's 1.2kg CO_2 equivalent/ha as rated by Carbon Associates, Australia.

TRIAL DETAILS

Trial Layout

The experiment was conducted using a randomised block design with four replicates of each treatment. Each treatment plot measured 4 metres x 3 metres with yield data being collected from the middle 1-metre swathe in each block. The trial was conducted and analysed by Neu-agri Consulting, South Africa.

Crop Data

Variety SST027 seed treated with Ingwe (Tebuconazole)
Site History Wheat
Planting Date 6/7/09
Harvest Date 16/11/09
Crop Protection Applications Conphidor for aphids 18/9/09
Seasonal Rainfall The trial is in a dryland winter wheat crop system in the winter rainfall region of the Western Cape, South Africa. Annual average is 600mm and the trial season was slightly above average.
Soil Type Sandy Loam

Soil Analysis

Acidity cmol/kg	pH KCl	P (citric) mg/kg	K mg/kg	Na mg/kg	Ca cmol/kg	Mg cmol/kg	NH4-N %	Total Cations cmol/kg
1.21	5.0	33	89	50	2.97	1.07	0.13	5.7

TwinN Application

Application 1

11/8/09. Applied starting 9.00am onto 2mm of overnight rain, temperature range 12-14°C, RH 94-86, foliage dry <3hrs.

Application 2

9/9/09. Applied starting 8.00am onto 11mm of overnight rain, temperature range 13-15°C, RH high, foliage dry >3hrs.

Applications were made using a knapsack with a flat fan coarse nozzle, 45psi (3 bar), 400 L/ha water.

CONCLUSIONS

- The trial site was very low in N as shown by the steep yield response to applied N fertiliser. The plots that received no N, basal fertiliser or TwinN failed to yield at all.
- Application of TwinN in combination with 25% N resulted in a significant yield increase over the 25% N alone. This option is not likely to be used in intensive agriculture but is relevant to situations where access to N fertiliser is limited due to cost or logistics.
- Application of TwinN in combination with 50% N resulted in a significant yield increase over the 50% N alone. T7, 50% N plus two TwinN applications, gave a yield that was not statistically different from the 100% control (T1). This suggests that, in this trial, an equivalent yield, or better, as that obtained by standard 100% N applications could have been achieved using a reduction of 40% N, plus TwinN.
- Carbon footprint reductions from use of TwinN are large. As an example, to produce the highest yield of 2.7 T/ha the producer can opt for 120 kgN/ha or 60 kgN/ha plus TwinN. The TwinN plus 60 kgN option will reduce the carbon footprint for the target yield (2.7 T/ha) by 25%.
- The trial did not show a consistent benefit to yield from application of TwinN at x2 concentration compared to application at x1 concentration.