

# BLACK™ Enhanced Efficiency Fertiliser - Commercial Field Demonstrations

Crop: Maize

Location: Zimbabwe Time: SUMMER 2009

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## **Background**

Black™ coated fertilisers, (Black Urea, Black DAP) have demonstrated internationally to enhance efficiency of inorganic fertilisers. That has enabled farmers to reduce the application rates of nitrogen and phosphorus by 15-35% and achieve the same, or economically superior, results. A study conducted in northern Zimbabwe by ART Research and local fertiliser distributors, set to determine the most effective nitrogen rate applied as Black Urea, and too compare the effects of Black DAP versus non-coated DAP under different nitrogen conditions.

## **Materials and methods**

A usual fertilizing regime in the region is granular UREA at 420kgs/ha, 125kgs/ha DAP, 45 kgs/ha MOP, 195kgs/ha gypsum. All trial plots received the gypsum and MOP at usual rates, for comparison, five different application rates of Black Urea (220, 270, 320, 370 and 420 kgs/ha) were applied with both coated (Black DAP) and uncoated (DAP) di-ammonium phosphate fertiliser. The usual rate of uncoated urea was applied with Black DAP as a control measure as was a Control with no fertiliser applied at all.

## **Trial Plots**

Three sites (namely Chiweshe, Musana and Zvimba) were located in communal areas where the soils are sandy and having less than 15 percent clay. Maize was planted in 0.9m row spacing with 0.5m between plants. A plot size of 5 rows by 5 meters long was used and only three centre rows harvested (13.5m<sup>2</sup>) Normal weed and pest control measures were applied.

## **Results**

Chiweshe produced the highest site mean yield of 8.56 t/ha while Zvimba and Musana yielded approx. half that rate (Table 1). The Zvimba and Musana soils were slightly sandier than Chiweshe to the extent that the control treatment yielded less than half a tonne.

Table 1: Grain yield (t/ha at 12.5% moisture content) of maize sown at 3 sites 2009 - 2010 season  
Site

<b>Table 1: Grain yield (t/ha at 12.5% moisture content) of maize sown at 3 sites 2009 - 2010 season</b>					
<b>Site</b>	<b>Chiweshe</b>	<b>Musana</b>	<b>Zvimba</b>	<b>Mean</b>	
<b>Treatment</b>					
BUREA 220 + BDAP	8.79	5.01	5.07	6.29	
BUREA 270 + BDAP	8.98	5.86	3.42	6.09	
BUREA 320 + BDAP	8.47	4.52	4.71	5.90	
BUREA 370 + BDAP	9.13	2.53	5.83	5.83	
OUREA 420 + BDAP	8.71	4.19	4.48	5.79	
BUREA 220 + ODAP	8.54	3.13	5.20	5.62	
BUREA 270 + ODAP	8.13	5.48	3.21	5.61	
BUREA 320 + ODAP	7.85	3.39	4.85	5.36	
BUREA 370 + ODAP	8.39	3.68	3.91	5.33	
BUREA 420 + ODAP	8.65	3.11	1.89	4.55	
CONTROL	6.28	0.40	2.41	3.03	
<b>Mean of treatments</b>	8.56	4.09	4.26	5.64	
<b>STD ERR</b>	0.75	0.17	0.42	0.45	
<b>Significance</b>	*	**	***		
<b>LSD (5%)</b>	2.26	0.49	1.25	1.33	
<b>C.V (%)</b>	16	8	18	14	
<b>Phosphate Comparison -</b>		<b>9.97%</b>	<b>increase in production by Black DAP</b>		
Black DAP - BUREA 220	8.79	5.01	5.07	6.29	11.86% increase in production
DAP - BUREA 220	8.54	3.13	5.20	5.62	
Black DAP - BUREA 270	8.98	5.86	3.42	6.09	8.56% increase in production
DAP - BUREA 270	8.13	5.48	3.21	5.61	
Black DAP - BUREA 320	8.47	4.52	4.71	5.90	10.01% increase in production
DAP - BUREA 320	7.85	3.39	4.85	5.36	
Black DAP - BUREA 370	9.13	2.53	5.83	5.83	9.45% increase in production
DAP - BUREA 370	8.39	3.68	3.91	5.33	

## Discussion and Conclusion

Nitrogen: the broad trend across the trial showed Black Urea consistently out yields uncoated urea across all application rates and even at significantly lower application rates. The lower application rates yielded the same or similar as higher rates suggesting a strong indication that the usual application rates are probably too high in the first instance. The superior results came with the lowest of the Black Urea rates, with Black DAP, though only when averaged over the three sites. Individual farm management would produce greater overall result as each farm had a different reduction in application rate producing the best result.

- At Chiweshe the treatment of Black Urea (220kg/ha) with Black DAP (145kgs/ha) produced the best economic result with fertiliser N+P Cost per ha of \$29 per tonne of grain produced.

- Musana's best result was a treatment of Black Urea (270kgs/ha) with Black DAP (145kgs/ha) which produced a tonne of grain with \$49/ha of fertiliser.

- Zvimba produced a tonne of grain with \$46/ha worth of fertiliser with the Black Urea (220kgs/ha) and uncoated DAP (145kgs/ha).

By comparison, the usual practice of uncoated Urea (420kgs/ha) produced a tonne of grain at Chiweshe (\$38/ha), Musana (\$80/ha), Zvimba (\$74/ha).

A new fertiliser program across the three farms would reduce (-35.4%) fertiliser input costs by \$68/ha/t (per hectare and per tonne of grain produced) and increase average yield production to 6.62t/ha from 5.70t/ha (+16.1%).

Phosphorus: a definite and strong trend of increased yield where Black DAP is used in replacement of un-coated DAP. A yield increase occurred across all farms, in all replications, at all application rates. Improvements in yield varied from 8.5% to 12% amongst different N rates, over the total trial treatment area, average yield increased almost 10% where Black DAP was used.

Further research is being undertaken to explore further nitrogen rate reductions and also reducing Black DAP rates to 25% less than uncoated DAP as is the manufacturer's recommendation.