REPORT ON THE FIELD EVALUATION OF COMCAT FERTILIZER ON MATURE COCOA

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Executive summary

Comcat fertilizer, as per the manufacturer's specification, contains Boron (<5 mg kg^{-1}), Iron (< 20 mg kg^{-1}), Zinc (< 5 mg kg^{-1}) and Copper (< 5 mg kg^{-1}). It was manufactured in Germany and was submitted to the Cocoa Research Institute of Ghana (CRIG) through Ghana Cocoa Board (COCOBOD) (DCE/AQC/FT.24/COCAT/31) on 4th January, 2024, by Winstep Company Limited. The objective was to assess the efficacy of Comcat fertilizer and make appropriate recommendations to COCOBOD. A laboratory test was conducted to ascertain the nutrient composition of the product. A phytotoxicity test with four rates (6 g, 9 g, 12 g and 15 g in 11 litres of water) was carried out at the CRIG nursery to determine optimum rates for field application. The field trial was carried out on farmers' farms at Kade (Eastern Region), Assin Sibinso (Central Region), Mim (Ahafo Region) and Jasikan (Oti Region) during the 2024/2025 and 2025/2026 cropping seasons. Ten- to fifteen-year-old mixed hybrid cocoa farms were used. The treatments tested were the two optimum rates of 60 g ha^{-1} $month^{-1}$ and 90 g ha^{-1} $month^{-1}$, equivalent to 360 g ha^{-1} yr^{-1} and 540 g ha^{-1} yr^{-1}, respectively, selected from the nursery study, a reference foliar fertilizer at the rate of 300 mL ha^{-1} $month^{-1}$, equivalent to 1.8 L ha^{-1} yr^{-1} and an unfertilized control was also included. The fertilizers were applied monthly for six months (May to October) in each season. The trial was laid out as a Randomized Complete Block Design (RCBD) with three replications per location. Results of the laboratory analysis indicated that the copper, boron, and zinc were slightly lower compared to the ones specified by the manufacturer, whereas iron was higher than the manufacturer's specification. There was no phytotoxic effect on the cocoa seedlings by Comcat fertilizer applied at 6 g, 9 g, 12 g and 15 g in 11 litres of water. Comcat fertilizer applied at the field rate of 60 g ha^{-1} $month^{-1}$ and 90 g ha^{-1} $month^{-1}$ gave higher cumulative dry cocoa bean yields of 1,485.3 kg ha^{-1} and 1,757.2 kg ha^{-1}, respectively, compared to 1,181.8 kg ha^{-1} for the unfertilized control plot. The reference foliar fertilizer gave a dry bean yield of 1,643.3 kg ha^{-1}. Comcat fertilizer applied at 90 g ha^{-1} $month^{-1}$ resulted in a significantly (p<0.05) higher dry bean yield than the reference foliar fertilizer. Based on the result, Comcat fertilizer is considered suitable for use on mature cocoa in Ghana. The application of Comcat fertilizer should be done at the field rate of 9 g in 11 litres of water (90 g ha^{-1} $month^{-1}$) at monthly intervals from May to October using a motorized spraying machine at nozzle 3.

Introduction

The average yield of cocoa beans in Ghana for the 2023 cropping season stood at 576.2 kg ha^{-1} (FAOSTAT, 2025). Factors such as injury to plants, nutrient loss through wrong placement, leaching and fixation of certain elements into unavailable forms sometimes decrease the fertilizer use efficiency of mineral fertilizers applied through soil. The application of foliar fertilizers has been suggested to be the most appropriate method of supplying mineral elements to crops, as it is environmentally safe with less loss (Dixon, 2003). Evidence shows that cocoa yield can be increased with the application of foliar fertilizers (Afrifa *et al.*, 2007). Foliar fertilizers have a high nutrient recovery rate, as the uptake of nutrients by the leaves takes place more quickly than the uptake of nutrients via the root (Chalker-Scoth, 2010).

Comcat fertilizer with formulation B <5 mg kg^{-1}, Fe < 20 mg kg^{-1}, Zn <5 mg kg^{-1} and Cu <5 mg kg^{-1} was manufactured in Germany and submitted to the Cocoa Research Institute of Ghana through COCOBOD (DCE/AQC/FT.24/COCAT/31) on 4th January 2024, by Winstep Company Limited. The objective of this study was to ascertain the efficacy of the product on mature cocoa and make recommendations to the COCOBOD.

Materials and Methods

Physical examination

The product was visually examined, and the information on the package was recorded.

Laboratory verification of the chemical composition of the product

A laboratory test was conducted to determine the boron, iron, zinc and copper using the Microwave Plasma Atomic Emission Spectrometer (MPAES) to ascertain the nutrient contents of the sample submitted for testing.

Phytotoxicity test

Four rates of Comcat fertilizer, *viz*, 6 g, 9 g, 12 g and 15 g in 11 litres of water, were tested on two-month-old cocoa seedlings for phytotoxic effect. Each treatment was sprayed once on ten (10) cocoa seedlings and observed for their leaf scorching and deformation for one month.

Field studies

The study was conducted on farmers' farms during the 2024/2025 and 2025/2026 cropping seasons at four locations, viz., Kade (Eastern Region), Assin Sibinso (Central Region), Mim

(Ahafo Region), and Jasikan (Oti Region). There were three replicates per location. The cocoa trees ranged in age from 10 to 15 years and were a mixed hybrid. The treatments used were as follows:

T1 = Comcat fertilizer at 6 g in 11 litres of water (60 g ha^{-1} $month^{-1}$)

T2 = Comcat fertilizer at 9 g in 11 litres of water (90 g ha^{-1} $month^{-1}$)

T3 = Reference fertilizer at 30 mL in 11 litres of water (300 mL ha^{-1} $month^{-1}$)

T4 = Unfertilized control

Each treatment was applied to a 0.1 ha plot. The foliar fertilizers were applied once a month for six months (May to October). One tank filling was used to cover a 0.1 ha plot, and this translated to 60 g ha^{-1} $month^{-1}$ (360 g ha^{-1} yr^{-1}) and 90 g ha^{-1} $month^{-1}$ (540 g ha^{-1} yr^{-1}) for T1 and T2, respectively. For the reference fertilizer (T3), the rate was 300 mL ha^{-1} $month^{-1}$ (1.8 L ha^{-1} yr^{-1}). The foliar fertilizers were applied using a motorized spraying machine at restrictor nozzle number 3. All CRIG-recommended agronomic practices (Opoku Ameyaw *et al.*, 2010) were followed.

Data collection and analysis

The total number of pods was used as a response variable for measuring the performance of the different fertilizers on mature cocoa. Total pods were categorized into fermentable and discarded pods. Dry cocoa bean yield was estimated from the number of fermentable cocoa pods using a pod value of 28.

Results and Discussion

Product description

Product name: Comcat fertilizer

MSDS: Present

Composition: B < 5 mg kg^{-1}, Fe < 20 mg kg^{-1}, Zn < 5 mg kg^{-1}, and Cu < 5 mg kg^{-1}

Physical appearance: Yellowish white powder

Country of origin: Germany

Manufacturer: Winstep Company Limited



Plate 1: A packaged sample of Comcat fertilizer as submitted by the company and poured out

Laboratory verification of the chemical composition of the product

The laboratory results indicated that boron, zinc, and copper were slightly lower than the specifications of the manufacturer. The iron content was higher than that specified by the manufacturer (Table 1).

Table 1: Analytical results of Comcat fertilizer sample

Sample	B	Fe	Zn	Cu
		(mg kg^{-1})		
Manufacturer's specifications	5	20	5	5
Laboratory result	4.5	21.5	4.6	4.7
Standard errors of mean	0.07	0.40	0.06	0.09

Phytotoxicity test

The results showed that there was no phytotoxic effect on the cocoa seedlings by Comcat fertilizer applied at 6 g, 9 g, 12 g and 15 g in 11 litres of water. There was no leaf scorching or deformation after one month of application. The two lower rates (6 g and 9 g in 11 litres of water) were chosen for the field study.

Field studies

Dry cocoa bean yield

Application of the foliar fertilizers at the four locations gave significantly ($p < 0.05$) higher cumulative dry cocoa bean yield when compared to the unfertilized control in the 2024/2025 (Year 1) and 2025/2026 (Year 2) cropping seasons (Table 2). Comcat fertilizer applied at 90 g

ha^{-1} month^{-1} had the highest cumulative yield, and this was significantly ($p < 0.05$) higher than the yield obtained by the reference foliar fertilizer at 300 mL ha^{-1} month^{-1}. The Comcat fertilizer applied at 90 g ha^{-1} month^{-1} was also significantly ($p < 0.05$) different from Comcat fertilizer applied at 60 g ha^{-1} month^{-1}. The unfertilized control had the lowest dry cocoa bean yield.

Table 2: Effects of different fertilizer treatments on cumulative dry cocoa bean yield per hectare

Treatment	Description	Year 1 Yield	Year 2 Yield	Cum. Yield
T1	Comcat at 60 g ha^{-1} month^{-1}	684.8	800.5	1,485.3
T2	Comcat at 90 g ha^{-1} month^{-1}	776.3	980.9	1,757.2
T3	Reference foliar fertilizer at 300 mL ha^{-1} month^{-1}	747.9	895.4	1,643.3
T4	Unfertilized control	509.7	672.0	1,181.8
Standard error of difference ($p < 0.05$)		51.3	70.2	108.9

Cum. Yield = Cumulative yield. Yield values are in kg ha^{-1}

Conclusion and Recommendation

The application of Comcat fertilizer resulted in significantly higher dry cocoa bean yield than the reference foliar fertilizer and the unfertilized control. Based on the results, Comcat fertilizer is considered suitable for mature cocoa production in Ghana. The application of Comcat fertilizer should be done at the field rate of 9 g in 11 litres of water (90 g ha^{-1} month^{-1}) at monthly intervals from May to October using a motorized spraying machine at restrictor nozzle number 3.

References

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