

# **APEX 10 Efficacy Trial Report**

Location:	KIAMBU AND KIRINYAGA
Crop:	FRENCH BEANS AND TOMATO
Product:	APEX 10
Dates:	27 November 2014 - 1 February 2015

Approval No. BIP/PS/16818/2014 By Ministry of Agriculture and KEPHIS.

Contract Signed, Approved by: Hezron Arunga  
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**ABSTRACT**

Following authorization by the Kenya Standing Committee on Imports and Exports (KSTCIE), A field trial was carried out in ecologically different locations namely Kirinyaga, Kiambu and Kajiado to determine the effect of Apex 10 on yield of French beans and tomato respectively.

These sites were selected because of the requirement to replicate the trial in different ecological regions. Three treatments of Apex 10 (0, 5L/ha and 9.5L/ha) were evaluated. The experiment was laid out in a complete randomized design having three replications. Harvests were done, data recorded and analyzed. Apex 10 was tested as a complement to standard fertilizer application. Data collected revealed that inclusion of Apex 10 at both concentrations had significant effect on French bean growth and yield. Although Apex 10 significantly influenced growth aspects of Tomato, yields for the trails were not attained due to a pest epidemic. This study concludes that Apex 10 application has growth and yield promoting abilities particularly when used alongside NPK. No Phytotoxicity was observed due to the application of Apex 10. An important observation was made on the ability of plants supplied with APEX 10 to tolerate some degree of water stress and this needs to be evaluated in detail as it could be of great use to the farming community. **This study therefore recommends that Apex 10 be registered as a humic/fulvic acid supplying fertilizer and growth promoter in Kenya.**

Table of Contents

INTRODUCTION..... 1

MATERIALS AND METHODS ..... 3

RESULTS ..... 4

CONCLUSIONS AND RECOMMENDATIONS ..... 6

RECOMMENDATIONS ..... 6

CONSTRAINTS ..... 7

ACKNOWLEDGMENTS? ..... 7

REFERENCESS ..... 8

APPENDIX 1 ..... 9

EXECUTIVE SUMMARY ..... 10

## **INTRODUCTION**

### **Background**

Apex-10 is made from all-natural humic substances with a stable dispersion of naturally occurring polyhydroxy carboxylic acids. It is an ideal additive to boost bioactivity and improve the performance of chemical, or organic fertilizers.

### **Function & Benefits of humic acids:**

- Enhance Nutrient uptake by combining nutrients and humic acid as well as keeping well balanced nutrients
- Improve the structure of soil, increase the buffering power of soil, and optimize N. P. K absorption by plants.
- Neutralize both acid and alkaline soils, regulate the PH value of soils, with the prominent effect in alkaline and acidic soil
- Reduce nitrate leaking into the groundwater and protect the underground water
- Enhance the resilience of crops, such as cold, drought, pest, disease and toppling resistance
- Stabilize nitrogen and improve nitrogen efficiency (as an additive with urea)
- Promote healthier, stronger plants and beautify appearance
- Buffering the effects of excessive elements (particularly sodium), toxic chemicals and heavy metals.
- Promoting seed germination in a shorter time
- Offering soil structure improvement by promoting fungi to create a crumb structure for better water and oxygen intake and improved root penetration
- Extending the performance of urea in the soil by 60-80 days and buffers the burning effect of urea as a foliar

To keep a sustainable agriculture development, we need to pursue using natural organic fertilizers like humic acid, this is what is important for us to create a better future of human lives. Soil infertility (specifically low organic matter and humic acid levels) has been identified in Kenya as a key constraint to achieving optimal production. Most soil analysis in farms produce recommendation of 5 tons per hectare of organic material, incorporated well into the soil. This is however difficult to achieve and thus alternative ways of providing crops with enough humic and fulvic acids are required. IPSP seeks to meet this need through introducing Apex-10 into the Kenyan agricultural sector. Following appointment by IPSP and authorized by KSTCIE, Apex-10 was trialed in Kiambu, Kajiado, and Kirinyaga Counties between November 2014 and February 2015.

### ***APEX 10 Efficacy Trial Report***

From results of a preliminary pot test and lab analysis, Apex 10 was applied at two rates, 9.5 L/ha and 5.0L/ha, as part of the standard foliar application regime for French beans and as a complement to chemical fertilizer in increasing yields. This was premised on the fact that APEX 10 does not provide Key nutrient elements and thus cannot be used as substitute for fertilizer.

The purpose of this efficacy trial was to examine the impact of Apex 10 on enhancing the production of French beans. The researcher had identified poor soil health and low organic matter (humic acid) content as a key constraint to achieving optimal yields in the trial site, and thus, Apex 10 was trialed in order investigate if it could remedy this limitation. Soil analysis results confirmed a need to significantly increase organic matter, humic and fulvic acids in the fields sampled.

The trials were conducted on French Beans, with 3 treatments replicated three times:

- (1) Apex 10 at Low Rate of 5.0L/ha + 100% Normal Fertilizer Practice
- (2) Apex 10 at High Rate of 9.5L/ha + 100% Normal Fertilizer Practice
- (3) Control - 100% Normal Fertilizer Practice

Aside from these treatments, all other inputs/practices were held constant. The researcher Identified several indicators for success (the results of which are discussed below), but the most important metric to track was total yield:

The Researcher noted that the Apex 10 treated plots could be harvested 1-2 more times than the control.

From these trials, we can recommend the lower Application Rate of 5L/ha to maximize the growers profitability per hectare and return on investment:

**MATERIALS AND METHODS**

**Trial Protocol**

In-field trials were set on French Beans (variety Star 2053). Apex 10 was applied at 9L/ha and 5.0L/ha on three plots each, as a spray. Apex 10 was applied on the Control block (also 3 plots). Aside from these treatments, all other practices were held constant.

	<b>Treatment 1:</b>	<b>Treatment 2:</b>	<b>Treatment 3 Control</b>
<b>Treatment:</b>	Apex 10 Low Rate 5.0L/ha + 100% Standard practice	Apex 10 High Rate 9.5L/ha + 100% Standard practice	Control 100% Standard practice without Apex 10
<b>Crop:</b>	French Beans	French Beans	French Beans
<b>Variety:</b>	Star 2053	Star 2053	Star 2053
<b>Date of Planting:</b>	27th November, 2014	27th November, 2014	27th November, 2014
<b>Plot Size:</b>	1 bed	1 bed	1 bed
<b>Replication</b>	3	3	3

**Parameters of study**

Data on the following parameters was collected:

- Germination rate
  - General crop performance
  - Any other noticeable differences observed during the trial period
- Number of Harvests
- Total Yield

**Trial Setup & Observation**

The trial was set up by the researcher and monitored by the KSTCIE team. Data observations were made every two weeks after planting and harvests were made as per standard French bean harvesting program.

**RESULTS**

**Growth**

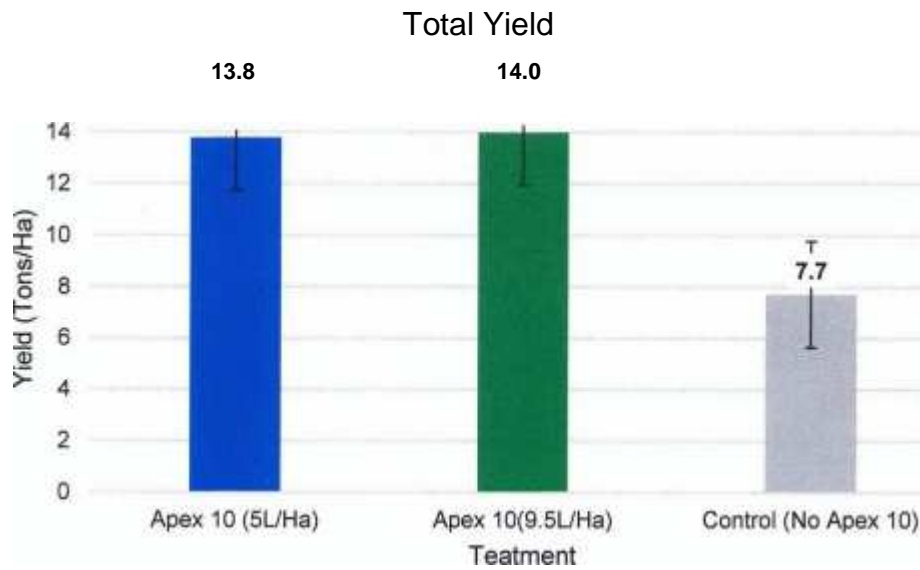
Germination in all plots was uniform but after application of the treatments, there was a marked change.

**Yield/Production:**

The APEX-10 High and Low Rates both exhibited robust plant growth which was reflected in the eventual 81% and 78% greater yield than the Control treatment respectively. This indicated that the addition of APEX 10 as a supplement to normal fertilizer regimes increases efficiency of utilization of the nutrients and stimulates plant growth.

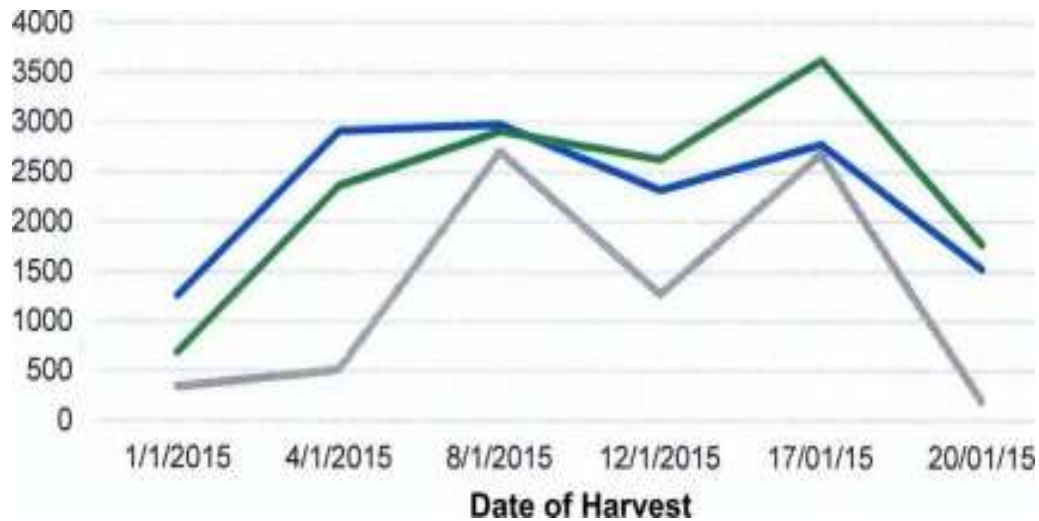
	Apex 10 Humic Acids Low Rate 5.0L/ha+ 100% Standard practice	Apex 10 Humic Acids High Rate 9.5L/ha + 100% Standard practice	Control 100% Standard practice without Apex 10
<b>Treatment:</b>			
<b>Number of harvests</b>	6	6	5
<b>Yield per hectare (Kg)</b>	13,789a**	13,989a	7,726b

\*\* Meana followed by the same letter in a row are not significantly different at P<0.05



The bar graph above illustrates the overall production performance of the two treatments of Apex 10 and the Control. Significant increases in production were observed in both Apex 10 treatments in comparison to the Control treatment (78% and 81% increases for the low and high rate respectively).

Yield Data (kgs) Across Harvest Period



The line graph above illustrates the trending of harvest volumes over a full harvest period of 3 weeks. Harvests on both treatments of Apex 10 performed better than the Control. Apex 10 application at the Low Rate started out higher than both the High Rate and the control but shortly evened out with the High Rate taking over the lead, and producing considerable peak at the fifth harvest of 253 kgs. We attribute the strong and consistent yield effect to: (1) the impact of high-quality and well-formulated product in unlocking the nutrients and making them readily available to the crop, (2) supplying additional phytohormones slowly and consistently to the crop over the harvest period, and (3) the impact of high-quality humic enabling the growth and multiplication of beneficial microorganisms, as well as supplying the humic and fulvic acids in correct quantities to support earlier crop establishment and greater harvests.

Apex 10 has been proven to be an effective complement to chemical fertilizer regimes. The historical effect of organic material increasing the use-efficiency of chemical fertilizers are well-documented and was proven consistent in this trial.





**Increased Capacity of crop to tolerate stress**

It was observed the Application of Apex-10 enabled the crop to tolerate some degree of water Deprivation. Plots irrigated every 3 days and given Apex-10 were able to produce significantly higher yields than even control plants that received water daily. This implies that farmers in water constrained regions may produce a crop by incorporating APEX 10 in their production regimes. Although this was not part of the main trial, initial observation in a pot experiment necessitated a wider trial to ascertain. The findings were corroborated in the main trial.

**CONCLUSIONS AND RECOMMENDATIONS**

The results of the current study demonstrate that addition of Apex 10 at either 5 or 9.5L per Ha into the production regime enhanced growth of French Beans and led to a significant increase in yields as compared to the control (NPK alone).

**RECOMMENDATIONS**

Based on the above results, it is recommended that Apex 10 be registered as a growth promoter and humic acid supplying fertilizer in Kenya. It should be noted that Apex 10 should not be a substitute for NPK and other mineral fertilizers should be used in a complimentary manner.

### **CONSTRAINTS**

The major constraint in the trial was the ravaging of the tomato crop by *Tuta absoluta* which rendered collection of yield data impossible. The researcher therefore requests to be allowed to present preliminary growth data as a new trial on tomato or alternative crop is set up.

### **ACKNOWLEDGMENTS**

Many thanks go to Kenya Standing Committee for Imports and Exports (KSTCIE) and Kenya Plant Inspectorate Service (KEPHIS) for commissioning and inspecting the progress of the trials. I wish also, to thank IPSP for providing the resources and test material required for this study. I wish also to thank the farmers in Kirinyaga, Kiambu and Kajiado for availing their land and valuable time. The technical assistance Dominik Okello and Lilian Wanjiru in carrying out this trial is highly appreciated.

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APPENDIX 1

FULL HARVEST DATA SET

	<b>Treatment 1</b>		<b>Treatment 2</b>		<b>Treatment 3</b>	
	<b>Apex 10 Low Rate</b>		<b>Apex 10 High Rate</b>		<b>Control</b>	
<b>Treatment:</b>	Apex 10 Low Rate 5.0L/ha + 100% Standard		Apex 10 High Rate 9.5L/ha + 100% Standard practice		Control 100% Standard practice* without Apex 10	
<b>Crop:</b>	French beans		French beans		French beans	
<b>Variety:</b>	Star 2053		Star 2053		Star 2053	
<b>Plot Size:</b>	3 sqm beds		3 sqm beds		3 sqm beds	
	<b>Date</b>	<b>Yield (kgs)</b>	<b>Date</b>	<b>Yield (kgs)</b>	<b>Date</b>	<b>Yield (kgs)</b>
	1/1/2015	2.67	1/1/2015	1.45	1/1/2015	0.73
	4/1/2015	6.15	4/1/2015	5.00	4/1/2015	1.09
	8/1/2015	6.30	8/1/2015	6.15	8/1/2015	5.73
	12/1/2015	4.91	12/1/2015	5.55	12/1/2015	2.70
	17/01/15	5.88	17/01/15	7.67	17/01/15	5.67
	20/01/15	3.24	20/01/15	3.76	20/01/15	0.42
<b>TREATMENT TOTAL</b>		<b>29.15a**</b>		<b>29.58a</b>		<b>16.33b</b>
<b>TOTAL PER HECTARE</b>		<b>13,789a</b>		<b>13,989a</b>		<b>7,726b</b>

\* Standard Practice -Recommended fertilizer regime for French beans, (NPK at planting and topdressing, 3 foliar sprays).

\*\* Mean followed by the same letter in a row are not significantly different at P<0.05

**EXECUTIVE SUMMARY**

1	Treatments	<p>1. Untreated control</p> <p><b>Foliar</b></p> <p>2. Apex-10 100% plus Full fertilizer practice.</p> <p>3. Apex-10 50% plus 100% fertilizer practice.</p> <p>4. 100% fertilizer practice</p> <p><b>Seedling dip</b></p> <p>5. Apex-10 dipping of planting material (tomatoes)</p>
2	Timing and Number of applications	<p>At planting- Tomato seedling dip</p> <p>Include as part of r foliar fertilizer program- at 5.0 and 9.5L per ha tank mixed</p> <p>NB: All other practices standardized across all treatments at</p>
3	Mode of application	<p>Dipping- Seedlings/seeds dipped in Apex-10 solution</p> <p>Foliar- Apex-10-Foliar sprayed on leaves every 21 days.</p>