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EFFICACY OF FULL ON LIQUID FERTILIZER (FOLF) ON THE YIELD OF PECHAY (*Brassica napus L.* var. Black Behi)

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EFFICACY OF FULL ON LIQUID FERTILIZER (FOLF) ON THE YIELD OF PECHAY (*Brassica napus L.* var. Black Behi) [1]

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ABSTRACT

The efficacy of **Full On Liquid Fertilizer (FOLF)** on the yield of pechay, var *Black behi* grown in a loamy soil was evaluated at Paulo Frenz Farm, Bago Gallera, Davao City from May to July 2019 coinciding the rainy periods in the area. Six fertilizer treatments replicated three times were evaluated to generate efficacy data for product registration purposes.

The application of the different fertilizer treatments had significantly influenced the yield of pechay. Plants in unfertilized control (T1) yielded the least of only 5.33t/ha. This was significantly inferior compared with the fertilized plots. The low yield was significantly improved by the mere application of Full On Liquid Fertilizer at its recommended dose (T5) resulting to 86.11% additional yield. However, this yield level was further increased when 50% (T4) or full dose of the reference fertilizer (T6) was added.

The further improvement of the yield enhancing effects of FOLF observed when reference fertilizer was added implies that the nutritional requirement of pechay to achieve maximum yield potential was not yet fully met by the sole application of FOLF at its recommended rate.

The superior effects of the sole application of FOLF over the unfertilized implied that it could be a stand alone fertilizer for organic pechay production. However, to further raise the bar of productivity, this has either to be combined with other foliar fertilizers or its rate of application maybe increased.

Keywords: Full On Foliar fertilizer, pechay yield

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I. Rationale:

Foliar fertilization is an important tool for the sustainable and productive management of crops. In recent years, foliar fertilizers and plant supplement, especially organic ones, have proliferated in the agricultural fertilizer market. If used wisely, they may be more environmentally friendly and target-oriented than soil fertilization since nutrients can be directly delivered to plant tissues during critical stages of plant growth (Kanan, 2010). Its importance could not be discounted in the realm of plant nutrition since certain soil conditions, such as pH, excess moisture, or cool temperatures, soil compaction may render a soil-applied nutrient or nutrients unavailable to the plant root.

Johnson *et al.* (2001) suggested that supplying N to peach trees using a combination of soil and foliar N fertilizers leads to optimal plant responses and limited environmental pollution risks. A similar efficacy relationship between foliar and soil K fertilization was demonstrated in rainfed olive trees grown in arid and semi-arid regions (Restrepo-Diaz *et al.*, 2009) in order to avoid problems associated with low K root uptake under limited soil moisture conditions. Similarly, a benefit of foliar P nutrition in dry-land cereal crops may occur when soil surface layers become dry thereby reducing the efficacy of surface P applications (Noack *et al.*, 2011). Foliar fertilizers can be used to enhance crop quality both in terms of grain protein and Zn content (Cakmak, 2008).

A nano-based liquid fertilizer, **Full On Liquid Fertilizer (FOLF)**, is formulated using an exclusive, proprietary nanotechnology with a guaranteed analysis of 1.0; 0.1 and 0.7 % NPK, respectively (http://growswicth.com). It comes from naturally chelated organic mineral matrix, finest fish hydrolyzed proteins, kelp extracts, amino acids, finest humic acids, enzymes, plant based surfactants and many more. It also acts as a biostimulant that enhances nutrient uptake and utilization ensuring fast and strong growth thus better quality of the produce and high yield. It could be applied as soil drench or as foliar spray.

Pechay, *Brassica napus* L, is a very popular leafy vegetable in the country that usually responds well to foliar fertilization. Prized for its leaves, proper nutrition and development of the plant must be ensured even in early leaf formation to assure high quality of the produced.

Being an imported fertilizer and a new entrant to the local fertilizer industry, **Full On Liquid Fertilizer** was formally evaluated to establish its efficacy on test crop specifically in pechay for product registration purposes, hence this study.

II. Objectives:

The efficacy of Full On Liquid Fertilizer (FOLF) on a leafy vegetable, pechay, was evaluated. Specifically, it determined the effect of FOLF on the yield of pechay and to generate bioefficacy data for product registration purposes.

III. Methodology:

A. Description of test product and reference products:

The product tested was **Full On Liquid Fertilizer**. It has an NPK content of 1.0%, 0.1% and 0.7%, respectively. The reference fertilizer is **Vegegrow**, a registered liquid fertilizer with 0.45% N, 0.25% O and 1.0%K content.

B. Experimental Conditions

- ***Test Location, Duration and Test Crop:***

  This study was conducted from May to July inclusive of land preparation and report writing at Bago Gallera, Davao City. The test crop was pechay (*Brassica napus* L. var Black Behi). The area was flat and with a loam soil with low organic matter and N content.

- ***Experimental Design and Treatments:***

  This study was laid in Randomized Complete Block Design (RCBD) in 3 replicates with six treatments. Each plot was separated by 0.5 cm space while each replicate was separated by 1.0 m space. The treatments were the following:

  T1 - control – no fertilizer
  T2 - 100% Recommended Rate (RR) of Reference Fertilizer (Vegegrow)
  T3 – 50% T2
  T4 – T3 + 100% Recommended Rate of FOLF
  T5 - 100% RR of FOLF
  T6 – T2 + T5

- ***Preparation of Test Materials, Construction of Raised Beds and Planting:***

  Pechay seeds were thinly sown on seedling trays raised under net roofing. Two weeks after seeding, seedlings were transferred to prepared raised beds or plots each measuring 1.0 m wide and 10 m long and 30 cm deep for a total dimension of **10.0m^2** per plot. The seedlings were transplanted 20 cm between rows and 15 cm between hills in the late afternoon.

  Care and Maintenance of Plants:

  All recommended cultural practices for pechay based on good agricultural practices were except for fertilizer application that was based on the treatments.

- ***Fertilizer Rates and schedule of application:***

The recommended rates of the test and reference products were applied at different periods starting at transplanting (as soil drench) and as foliar spray every 7 days interval till one week before harvesting (Table 1).

Spraying was always done either in early morning or very late in the afternoon to ensure maximum absorption by the plants at 300L spray volume per hectare. To avoid contamination between treatments or plots due to spray drift, during treatment application (*i.e*. spraying), a laminated plastic sack was used to enclose the plot being sprayed.

Table 1. The schedule and rate of application of the fertilizers.

Treatments	Days after transplanting (DAT)			
	at 0 DAT (as soil drench)	**@ 7 DAT as foliar spray**	**@ 14 DAT as foliar spray**	**at 21 DAT as foliar spray**
T1 - control – no fertilizer	-	-	-	-
T2 - 100% Recommended Rate (RR) of Reference Fertilizer - VG	5ml/L water	5ml/L water		5ml/L water
T3 – 50% T2	2.5ml/L water	2.5ml/L water	-	2.5ml/L water
T4 – T3 + 100% Recommended Rate of FOLF	2.5ml VG/L water + 4 ml **Full On**/ gal	2.5ml VG/L water + 4 ml **Full o**n/gal of water	4 ml **Full o**n/gal of water	2.5ml VG/L water + 4 ml **Full o**n/gal of water
-T5 - 100% RR of FOLF	4 ml **Full On**/ gal of water as soil drench	4 ml **Full o**n/gal of water	4 ml **Full o**n/gal of water	4 ml **Full o**n/gal of water
T6 – T2 + T5	4 ml **Full On/** gal of water	4 ml **Full o**n/gal of water	4 ml **Full o**n/gal of water	4 ml **Full o**n/gal of water

- ***Data Collection:***

  The data collected were on **marketable yield (t/ha)** – The total marketable yield was based on the average fresh weight of marketable plants per net plot after trimming off and converted to yield in tons/ha. Likewise, **weather data:** daily rainfall (mm) within the trial duration from nearest agromet station was collected.

- **Statistical Analysis:**

Only the yield data was subjected to appropriate Analysis of Variance (ANOVA) and means that were found out significant were compared using Duncan's Multiple Range Test (DMRT).

IV. RESULTS AND DISCUSSION:

The application of the different fertilizer treatments had significantly influenced the yield of pechay. It was observed that the highest computed marketable yield of 15 t/ha was obtained in T6 plots applied with the combined full doses of FOLF and Reference fertilizer (Table 2). This was comparable, however, with plants applied with 50% of the reference and 100% FOLF (T4) yielding 12.17 t/ha.

The lowest yield was obtained in unfertilized plants (T1) with only 5.33 t/ha. The sole application of FOLF (T5) yielded 9.92 t/ha or 86.11% higher over the control making the application significantly superior over the unfertilized. Likewise, this yield was comparable with the yield obtained in plots applied with 100% reference fertilizer (T2) with 9.33 t/ha. The reference and the test products are both foliar fertilizers with comparable nutrients content.

The yield enhancing effect of FOLF was further improved by the addition of either 50% of the reference fertilizer (T4) or its full rate (T6) implying that the nutritional requirement of pechay to achieve maximum yield potential was not yet fully met by the addition of FOLF at its recommended rate.

The significant yield improvement over the control by the mere application of FOLF, suggest that this would be a stand alone fertilizer for organic pechay production. However, for maximum benefit this could be applied in combination with reference fertilizer or better still applied at a higher rate to further increased yield levels.

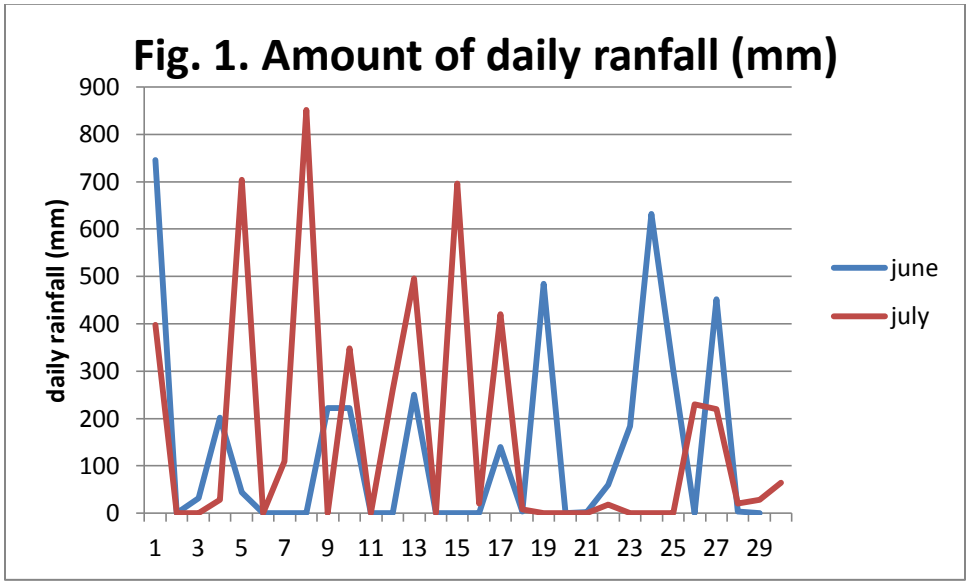
The enhanced productivity of pechay when FOLF was applied either alone or in combination with other foliar fertilizers could be both attributed to improved mineral nutrition with the presence of NPK and the better uptake and utilization of the applied nutrients through foliar application. FOLF acts as biostimulant that enhanced nutrient uptake and utilization ensuring fast and strong growth and better quality of the produce.

Johnson et al (2001) reported that supplying N to peach trees using a combination of soil and foliar N fertilizers led to optimal plant responses and limited environmental risks.

Table 2. Computed marketable yield (t/ha) of pechay as influenced by the different fertilizer treatments (Bago Gallera, Davao City, July 2019).

Treatments	Marketable yield (t/ha)	% increase over the control
T1 - control – no fertilizer	5.33d	-
T2 - 100% Recommended Rate (RR) of Reference Fertilizer - VG	9.33bc	75.47
T3 – 50% T2	7.00c	31.3
T4 – T3 + 100% Recommended Rate of FOLF	12.17ab	128.33
-T5 - 100% RR of FOLF	9.92bc	86.11
T6 – T2 + T5	15.00a	181.42
Stag. Sig.	**	
CV (%)	8.97	

Within the trial duration and measured at the nearest PAG-ASA weather station, rain was frequent thus water was not limiting (Fig. 1). However, this predisposed the plants to fungal disease but which was controlled by fungicide application.



V. SUMMARY AND CONCLUSION:

The efficacy of Full On Liquid Fertilizers on the yield of pechay, var *Black behi* grown in a loamy soil was evaluated at Prince Farm, Bago Gallera, Davao City from June to July 2019 coinciding the rainy periods in the area. Six fertilizer treatments replicated three times were evaluated to generate efficacy data for product registration purposes.

The application of the different fertilizer treatments had significantly influenced the yield of pechay. Plants in unfertilized control (T1) yielded the least of only 5.33t/ha. This was significantly inferior compared with the fertilized plots. This low yield was significantly improved by the mere application of Full On Liquid Fertilizer at its recommended dose (T5) resulting to 86.11% additional yield. However, this yield level was further increased when 50% (T4) or full dose of the reference fertilizer (T6) was added. This implied that the nutritional requirement of pechay to achieve maximum potential yield was not yet fully satisfied by the current application rate of FOLF.

The superior effects of the sole application of FOLF over the unfertilized implied that it could be a stand alone fertilizer for pechay. However, to further raise the bar of productivity, this has either to be combined with other foliar fertilizers or its rate of application maybe increased.

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CERTIFICATION ON THE ADOPTION OF GOOD AGRICULTURAL PRACTICES (GAP)

This is to certify that the study evaluating the efficacy of **Full On Liquid Fertilizer (FOLF)** applied either alone or in combination with liquid foliar fertilizers was conducted following Good Agricultural Practices.

Done this 31st day of July 2019 at Davao City, Philippines.

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Annex 1. ANOVA

DATA: MARKETABLE YIELD (t/ha) of Pechay

	I	II	III	totals	mean	
T1-Control	3.8	5.8	6.5	**16.0**	**5.33**	d
T2-100% RF(VG)	7.5	10.0	10.5	**28.0**	**9.33**	bc
T3-50% RF (VG)	5.5	7.5	8	**21.0**	**7.00**	c
T4-50%RRIF + 100%RR FOLF	10.5	11.2	14.8	**36.5**	**12.17**	ab
T5- 100% FOLF	8.0	10.3	11.5	**29.8**	**9.92**	bc
T6-T2 + T5	11.5	16.5	17.0	**45.0**	**15.00**	a
Rep totals	46.8	61.3	68.3			
Grand total				**176**		
Grand mean					9.8	
CF					1725.78	

ANOVA TABLE

					F-TAB	
SV	DF	SS	MS	Fc	5%	1%
REP	2	40.08333	20.04167	26.00	3.3	4.73
TRT	5	181.98958	36.39792	47.219	3.46	5.06
ERROR	10	7.70833	0.77083			
TOTAL	17	229.78125				
cv	8.97					
Std error, s_d	0.72					

Annex II. Photo Documentation

Annex Fig.1. View of the trial site.

Annex Fig. 2. Stand of pechay plants under T2 (reference fert); T1 (control) and T5 (FOLF)

Annex Fig. 3. Stand of pechay plants under T3 (50% RF); T4 (T3+T5) and T6 (T2 and T5)

Annex Fig. 4. Marketable pechay plants under T3 (50% RF); T4 (T3+T5) and T6 (T2 and T5)