THE POTENTIAL OF TITHONIA DIVERSIFOLIA (WILD SUNFLOWER) AS ORGANIC FOLIAR FERTILIZER

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Abstract
Indigenous farming practices include the use of wild plants like sunflowers to sustain crop production. This practice becomes the present trend in sustainable agriculture aside from promoting healthful living, safe environment and improving economic condition. This study was conducted to determine the potential of Tithonia diversifolia (wild sunflower) as organic foliar fertilizer using pechay (Brassica rapa) as experimental plant. The randomized complete block design was used with the mixture ratio of water with sunflower leaves and stems as treatments with three replications including positive and negative treatments. The different treatments were applied to a pechay plant. The weight and height of the pechay plant were measured after application. The treatment weight and height means were compared using the analysis of variance. Significant means were further compared using the least significant difference. The gathered data were analyzed using the SPSS version 12. Results showed that of the experimental treatments, the mixture ratio of 1.5kg sunflower leaves to 1L water had the highest pechay plant weight and height means which do not significantly differ to that of the positive control treatment. This shows a comparable potential of Tithonia diversifolia (wild sunflower) as foliar fertilizer that can be tested in other crops.

Keywords: Indigenous farming, sustainable agriculture, organic foliar fertilizer

Introduction
Tithonia diversifolia is a scientific name for a sunflower which belongs to the genus of annual and perennial herbs of composite flowers. This genus is thought to be native to South America. There are about 67 sunflower species worldwide (Microsoft Corporation, 2006).

In Kenya, Wanjiru (2003) reported that farmers in the outskirts of Kenya have discovered that wild sunflower (Tithonia diversifolia) replenishes soil fertility and increase their crop yields. Likewise, African scientists tested a wild sunflower plant and found out substantial amount of nitrogen and have the ability to enhance phosphorus availability in soil.

Sunflower is reported to have nitrogen (N), phosphorous (P) and potassium (K) the required elements to make a complete fertilizer (Erpelo P. 2009). In India, one tonne of fresh leaves and tender stems was reported by Nagarajah and Nazar (2013) to provide 5 kg N, 1 kg P₂O₅ and 10 kg K₂O. Philippine Rice researchers have found out that sunflower leaves have high nitrogen content (2.9 percent oven dry weight) and that fresh sunflower can be given an equivalent of 60 N kg/ha. (http://www.aseanbiotechnology.info/News/24000932.htm 26/12/2004/). Moreover, Nyasimi et al. (1997) reported that Tithonia diversifolia leaves (dry matter) contain an average of
Nitrogen (N) 3.17 percent, Phosphorus (P) 0.3 percent, Potassium (K) 3.22 percent, Calcium (Ca) 2.0 percent and Magnesium (Mg) 0.3 percent.

Organic farming, like the use of wild sunflower, is being encouraged by concerned agencies for environmental, health and economic reasons. In the Cordillera Region, sunflowers thrive along the roadsides. Farmers in Ifugao and Mountain Province have been using this wild sunflower (*Tithonia diversifolia*) to fertilize rice, vegetables, and sweet potato (http://www.philstar.com/agriculture/267547/wild-sunflower). In indigenous communities of Kalinga, wild sunflowers are found in spaces between and around rice paddies. These are mixed with the rice fields before planting to rot as fertilizers.

This paper presents the results of the study on the effects of wild sunflower as foliar fertilizer to the weight and height of *Brassica rapa* L.

**Materials and methods**

The randomized complete block design (RCBD) was used in this study. The mixture ratios of the different sunflower parts were used as treatments with three replications as follows; Treatment 1 (T1) = 1.5kg chopped leaves to 1L of tap water, Treatment 2 (T2) = 1.5kg chopped stems to 1 L of tap water, Treatment 3 (T3) = 0.75Kg leaves + 0.75 Kg soft stems + 1L tap water, Treatment 4 (T4) plain tap water as negative control and Treatment 5(T5) 1g urea (commercial) to tap 1L tap water as positive control.

Materials used in this study include graduated cylinder, 2 feet ½ foot wooden box, knife, chopping board, containers, analytical balance(BBL-51), composite soil samples and *Brassica rapa* L. (Black Behi) seeds.

Fifteen wooden boxes were filled with homogenized composite soil samples. The pechay seeds were germinated and transplanted after 7 days. Pechay seedlings were planted in each box. The experimental treatments were prepared following the indicated above ratio. Fresh leaves and stems of the sunflower growing in one area were separately weighed and chopped. The chopped samples were placed in separate containers following the above treatment ratio. The mixtures were left undisturbed for 2 days. The positive control treatment was prepared based on the indicated mixture ratio. The treatments were applied to the transplanted pechay plants two times a day days. After 15 days, the pechay plants were harvested and measured in terms of weight and height. The analysis of variance (Anova) was used to compare the means of the different treatments. Significant means were further compared using the Least Significant Difference (LSD). The SPSS version 12 was used to analyze the gathered data for interpretation.

**Results and Discussions**

Table 1 presents the different treatment ratios used a foliar fertilizer. It shows that T3 has the lowest mean weight of 4.3139 followed by T4 with 5.1062, T2 with 5.3316, T5 with 7.2561 while T1 has the highest weight mean of 8.7682 g.

<table>
<thead>
<tr>
<th>Mixtures (Treatments)</th>
<th>Weight/yield (g)</th>
<th>Height (mm)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Treatment 3 (T3)</td>
<td>4.3139</td>
<td>156.3333</td>
</tr>
<tr>
<td>Treatment 4 (T4)</td>
<td>5.1062</td>
<td>170.3333</td>
</tr>
<tr>
<td>Treatment 2 (T2)</td>
<td>5.3316</td>
<td>169.0000</td>
</tr>
<tr>
<td>Treatment 5 (T5)</td>
<td>7.2561</td>
<td>177.6667</td>
</tr>
<tr>
<td>Treatment 1 (T1)</td>
<td>8.7682</td>
<td>196.3333</td>
</tr>
<tr>
<td>Total Mean</td>
<td>6.1552</td>
<td>173.9333</td>
</tr>
</tbody>
</table>
As to the mean height of pechay plant, T3 has the lowest mean height of 156.3333 followed by T2 with 169.0000 and T4 with 170.3333, furthermore T5 has a mean height of 177.6667 while T1 having now the highest mean of 196.3333.

Part of this study is to determine what mixture ration can increase the weight and height of the pechay plant.

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<tbody>
<tr>
<td>Treatment 3 (T3)</td>
<td>4.3139A</td>
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</tr>
<tr>
<td>Treatment 4 (T4)</td>
<td>5.1062A</td>
<td>170.3333A</td>
</tr>
<tr>
<td>Treatment 2 (T2)</td>
<td>5.3316A</td>
<td>169.0000A</td>
</tr>
<tr>
<td>Treatment 5 (T5)</td>
<td>7.2561B</td>
<td>177.6667AB</td>
</tr>
<tr>
<td>Treatment 1 (T1)</td>
<td>8.7682B</td>
<td>196.3333B</td>
</tr>
<tr>
<td>Total Mean</td>
<td>6.1552</td>
<td>173.9333</td>
</tr>
<tr>
<td>F-ratio</td>
<td>9.244**</td>
<td>3.646*</td>
</tr>
<tr>
<td>P</td>
<td>0.002</td>
<td>0.044</td>
</tr>
</tbody>
</table>

**=Significant at 0.01
*=Significant at 0.05
Note: Means with the same letter are not significantly different (LSD)

Among the experimental treatments, Table 2 shows that T1 has a significantly high weight compared to the other treatments (F=9.244, P≤0.002). Likewise in terms of height, T1 has a significantly longer stem height than the other treatments (F=3.646, P≤0.044). The mean weight and stem height of T5 are comparable to the positive control treatment commercial fertilizer urea (T5). These similarities apparently indicate the same effects of both treatments to pechay plant probably due to the presence of common nutritional contents of sunflower leaves and urea.

Nyasimi et al. (1997) reported experimental studies in Kenya that wild sunflower used as green manure consistently increased crop yield.

Liasu, M.O. and Achakzai, A.K.K (2007) applied T. diversifolia leaf much and fertilizer to potted tomato plants and found out a significant increase in the number of leaves and height.

In Nigeria, Ademiluyi, B.O. and Omotoso, S.O. (2007) reported a higher vegetative and reproductive growth of maize in the Tithonia incorporated soil in terms of height and stem girth under the NPK fertilizer soils.

**Conclusions**

Results of this study indicate that wild sunflower plant leaves water extract can be used as alternative source of organic foliar fertilizer to increase yield of leafy vegetables like pechay plant.

**References:**
[http://www.philstar.com/agriculture/267547/wild-sunflower](http://www.philstar.com/agriculture/267547/wild-sunflower)
[http://agrilearning.govila.k/Paddy/Paddy_Research/Paddy_pdf/A27](http://agrilearning.govila.k/Paddy/Paddy_Research/Paddy_pdf/A27)
“Sunflower“ Microsoft Student 2007 (DVD), Redmond, W.A. Microsoft Corporation. 2006