

The Efficacy of Biol and Biosol on the Growth of Marigold (*Tagetes Erecta*) in Rice Hull and River Sand Soiless Based Medium

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Abstract:

Biosol (organic manure) was mixed with ricehull/riversand medium of varying levels viz 0:8, 1:8, 1:4, 3:8, 1:2 (v/v of biosol/manure) to produce five media. The five media were combined with biol (liquid manure) at three levels viz no watering, watering every four days and watering every two days to grow pot marigold to flowering stage. The plants were grown one plant per pot in 1:4 L pot and replicated five times. A soft pinch was given to the plants before transplanting and allowed to stabilize for a week before watering with biol. After five weeks of transplanting, the following measurements were taken: plant height, dry weight of the stem, number of flower buds, root dry weight, flower number per pot, flower dry weight, number of branches and stem girth. The result showed that plants with the highest level of biosol produced the highest number of branches, highest plant height, highest stem girth, while plants without biosol produced the least plant height, least stem girth. Plants watered with the highest quantity of biol was detrimental to flower production and watering with biol every four days and biosol at highest level produced the best quality plants

KEYWORDS: *Biol, Biosol, Marigold, Rice hull, River sand, Soiless.*

INTRODUCTION

Marigold (*tagetes erecta*) is one of most commonly grown floral crop in India and are used extensively on religious and social function in different forms. Because of their ease in cultivation, wide adaptability to varying soil and climate condition, long duration of flowering and attractive coloured flowers of excellent keeping quality, the marigold has become one of the most popular floral crops. As cut flower, they are used in the market as loose or as garland. Due to the variable length and colour, marigold is used for decoration and included in the landscape planting Lazarovites, (1991). There are about 33 species of marigold and numerous varieties, however, two common types of marigold are; African marigold (*Tagetes erecta*) and French marigold (*Tagetes patula*). French marigold originated from Mexico while African marigold originated from Africa. They possess compound leaves which are deeply cut with a characteristic odor. The African marigold ranges from dwarf to tall plant up to 90cm. they have large double flower of lemon, yellow, golden yellow, and primrose orange or bright yellow colour. Because there are dwarf varieties, marigold can

be used as flowering pot plant. The important varieties include Giant, double African orange, double African yellow, Crakes jack, climax doubloon, Golden age, chrysanthemum charm, grown of gold, spun, Noling and backer 1988.

Growing plants in containers using soilless media requires careful management of the physical properties of the medium. (Mbah 1993). Also of great importance is the management of the chemical component especially in the application of nutrient. Application of liquid fertilizer in low concentration is most common as well as the use of low release fertilizer (Hershey and Paul, 1982). There are no controlled release fertilizer in Nigeria, known so far, that can be used in pot plant production. Mbah and Adenuyi 1994 Produced pot plants successfully using blood meal which is an organic source of nutrient with slow release properties. However blood meal is not easily available. Other sources of organic fertilizers can be used as well. In this work, Biosol and Biol were used for the production of pot marigold

OBJECTIVE OF THE STUDY

The objective of this study is to determine the effect of organic fertilizer (Biosol and Biol) on the production of pot plant Marigold (*Tagetes erecta*) in a soilless medium.

MATERIALS AND METHOD

The experiment was carried out in the green house of Department of Crop Science, University of Nigeria Nsukka between September 2016 and April 2017.

For media components, river sand was collected at a new building site of the University of Nigeria Nsukka. Rice hull was collected from Adani in Uzouwani Local; Government Area of Enugu State. Biosol and Biol were prepared for use before the study. For media composition, Rice– hull was mixed with river sand at the ratio 9:1, then biosol (solid organic manure) used was mixed with the medium at the following ratios; $0/8, 1/8, 1/4, 3/8, 1/2$

Medium	Biosol
(Rivers and Rice-hull) (Organic Biosol Fertilizer)	

Volume	Volume
8	0
8	1
8	2
8	3
8	4

Biosol and Biol preparation were carried out according to the method of Osorio (2005), it was prepared by adding equal volumes of poultry manure and water in a 200L capacity of plastic barrel. Five litres of stomach content of freshly slaughtered cattle was added to the plastic barrel to aid compositing. The barrel was clamped and a little outlet for gas was provided on the lid of the barrel. The whole set up was an air tight bio digester, left to compost anaerobically for 3 months. After 3 months, the barrel was opened and the liquid fraction called boil and solid fraction biosol were used in the study

Raising of seedlings and transplanting

Seeds of marigold were planted in a seed box and raised in nursery in the green house for 4 weeks. Medium used was made of top soil and river sand. After 4 weeks in the nursery, the seedlings were transplanted one plant per pot into a 1.4 liter volume pot. A soft pinch was given to the plants during transplanting. The plants were allowed to stabilize for a week before the liquid feed treatment was mated with boil.

For experimental treatment, there were two factors; factor one was media at five levels consisting of varying quantities of biosol in the medium; 0:8, 1:8, 1:4, 3:8, 1:2 v/v ratio of biosol while factor two was boil at three levels; watering without boil, watering at every four days, and watering at every two days interval.. 1 liter was mixed with four liters of water before use. The plants were watered two days and allowed to grow for five weeks to flowering stage, A completely randomized design was used for the analysis of data The following measurement were taken

1. Plant height in (cm): this was measured with tape at anthesis
2. Dry weight of the stem: this was taken after harvest that is 10 weeks after transplanting and dried in an oven at 35^oc for 24 hours.
3. Number of flower buds not open that was formed per crop was also taken.
4. Root dry weight: The roots were carefully washed out of the media and oven dried at 35^oc for 24 hours.
5. Flowering number/Dry weight: The number of flowers per pot (that is open flower was also taken) just after harvest, was dried and weighed
6. The number of branches: The number of branches were taken when the plant has fully matured
7. The flower opening: The number flowers open per pot was determined
8. Plant girth: This was measured with micro screw gauge (mm)

RESULT

The highest number of branches was produced by medium with the highest quantity of biosol [1:2] which did not differ significantly with biosol [1:8] but was higher than other media [Table 1]. The least number of branches was produced by medium without biosol

Generally, boil did not affect the number of branches significantly, however, watering with boil every four days produced the highest number of branches.

The number of branches produced was significantly affected by interaction between boil and biosol. No biosol and no boil produced the least number of branches while 1: and watering with boil every 4 days produced the highest of branches which did not differ significantly with Biosol 1:2 X no boils.

Biosol 1:8 X every 4 days watering with biol but was higher than all other Biosol X Biol combinations.

TABLE 1: Effect of boil and biosol on the number of branches/plant

Biosol [bs]	0	BIOL every 4 days	Every 2 days	Mean biosol
0 [1/8]	5.5	8.4	5.8	6.6
1 [1/8]	13.0	16.3	10.2	13.1
2 [1/4]	10.0	7.0	9.0	8.9
3 [3/8]	9.8	9.0	7.6	8.6
4 [1/2]	14.0	17.5	12.4	14.6
Mean	10.5	11.6	9.0	

LSD For 2 BS mean [BS] = 2.65

LSD For 2 BL means [BL] = 2.06

LSD for 2 BS X BL Interaction = 4.60

Addition of biosol significantly affect the flower dry weight. The medium with the highest quality of biosol [1:2] produced the highest flower dry weight. The medium with no biosol produced the least flower dry weight [Table 2].

Biol did not affect the flower dry weight. No boil produced by plants watered with boil every 2 days.

There was no significant interaction between boil and biosol. No boil and no biosol produced the least flower dry weight while 1:2 biosol and no boil produced the highest flower dry weight.

Table 2: effects of boil and biosol on flower dry weight (g)

Biosol [bs]	0	BIOL every 4 days	Every 2 days	Mean biosol
0 [1/8]	0.0	0.3	0.3	0.2
1 [1/8]	0.5	0.7	1.0	0.7
2 [1/4]	0.6	1.1	1.4	1.0
3 [3/8]	0.3	0.3	0.4	0.4
4 [1/2]	7.9	0.5	0.2	2.8
Mean biol	1.9	0.6	0.7	

LSD For 2 means [BS] = 1.96

LSD For 2 BL means [BL] = [ns]

LSD For 2 BS x BL Interaction = 3.40

The highest number of flower was produced by the medium 1.4 which was significant higher than other number of flowers. The medium with 1:2 biosol produced the least number of flowers

[Table 3]

Biol did not significantly affect the number of flowers produced. No biol produced the least number of flowers while watering with biol every 2 days produced the highest number of flowers.

There was significant interaction between biol and biosol. Watering with biol wevery 2 days and 1:2 biosol and no biosol X no biol produced the least number of flowers while 1:4 biosol and watering with biol evry 4 days produced the highest number of flowers which differ significantly with biosol 1:4 X no biol; biosol 1:4 X every 2 days biol, biosol 1:8 X no biol, and biosol 3:8 X every 2 days biol.

Table 3: Effects of Biol and Biosol on number of flowers per pot.

Biosol [bs]	0	BIOL every 4 days	Every 2 days	Mean biosol
0 [1/8]	1.8	2.0	2.2	2.0
1 [1/8]	2.0	3.7	4.6	3.5
2 [1/4]	7.3	8.6	8.0	8.0
3 [3/8]	4.6	1.5	4.8	3.6
4 [1/2]	2.0	2.0	1.8	1.9
Mean biol	3.5	3.6	4.3	

LSD For 2 BS means [B] = 2.36

LSD For 2 BL mean [BL] = [ns]

LSD For BS X BL Interaction = 4.08

Te highest plant girth was produced by medium with highest quantity of biosol 1:2 and the least plant girth was produced by the medium without biosol [Table 4]

Biol did not every 2 days produced the highest stem girth, while no biol and every 4 day application between biol and biosol. No biol X 1:4 biosol produced the least plant stem girth while 1:4 biosol and watering with biol every 2 days produced the highest plant girth, which did not differ significantly with 1:2 biosol X on biol, 1:2 biosol X every 4 days watering biol 1:2 biosol X every 2 days watering with biol ad 1:4 biosol X every 4 days watering with biol.

Table 4: effects of Biol and Biosol on Marigold stem girth mm/pot

Biosol [bs]	0	BIOL every 4 days	Every 2 days	2	Mean biosol
0 [1/8]	3.9	4.3	4.0		4.1
1 [1/8]	5.2	4.0	4.0		4.4
2 [1/4]	3.5	4.4	5.6		4.5
3 [3/8]	4.0	4.0	4.1		4.0
4 [1/2]	5.3	5.2	4.6		5.0
Mean biosol	4.4	4.4	4.5		

LSD For 2 [BS] means = 0.56

LSD For 2 [BL] means = [ns]

LSD For 2 BS X BL Interaction = 0.97

The highest root dry weight was produced by the medium 1:4 which not differ significantly with medium 1:8 but was higher than other media [Table 5]

Biol significantly affected the root dry weight, plants watered with biol every 2 days interval and no biol produced similar root dry weight which was higher than plants watered with biol every 4 days.

Root dry weight was significantly affected by the interaction of biol and biosol. Watering with biol every 4 days X medium without biosol, 4 days X biosol 1:4 and no biol X biosol 1:4 produced the same root dry weight which did not differ significantly with biosol 1:8 X biol at all levels. While watering without biol X no biosol, watering every 4 days X no biosol, biosol 3:8 X all levels of biosol 1:2 biol at all levels produced the highest root dry weight.

Table 5: Effects of Biol and Biosol on root dry weight [g/flower]

Biosol [bs]	0	BIOL every 4 days	Every 2 days	2	Mean biosol
0 [1/8]	0.2	0.2	0.4		0.2
1 [1/8]	0.3	0.3	0.3		0.3
2 [1/4]	0.4	0.3	0.4		0.4
3 [3/8]	0.2	0.2	0.2		0.2
4 [1/2]	0.2	0.2	0.2		0.2
Mean biosol	0.3	0.2	0.3		

LSD For 2 BS means [BS] = 0.12

LSD For 2 BL means [BL] = 0.09

LSD For 2 BS X BL interaction = 0.20

The highest plant height was produced by the medium with highest quantity of biosol [1:2] which did not differ significantly with medium [1:8] but was higher than other media [Table 6]. And medium without biosol produced the least number of plant height.

Moreover, biol did not affect the plant height significantly, however, watering with biol every 2 days produced the highest plant height and watering without biol produced the least plant height.

There was significant interaction between biol and biosol. No biol X no biosol produced the least plant height, while 1:8 biosol X watering with biol every 4 days produced the highest plant height.

Table 6: the Effects of biol and biosol on plant height [cm]

Biosol [bs]	0	BIOL every 4 days	Every 2 days	2	Mean biosol
0 [1/8]	21.06	25.6	24.6		23.9
1 [1/8]	26.5	31.2	29.7		29.1
2 [1/4]	23.0	24.3	25.2		24.2
3 [3/8]	24.8	24.1	24.4		24.4
4 [1/2]	27.7	29.5	24.3		29.5
Mean biol	24.7	26.9	27.0		

LSD For 2 means [BS] = 2.18

LSD For 2 means [BL] = [ns]

LSD For 2 BS X BL interaction = 3.77

Number of flower buds was significantly affected by biosol [Table 7]. Biosol 1:2 produced the highest number of flower buds while medium without biosol produced the least number of flower buds.

Biol did not significantly affect the number of flower buds; however watering with biol every 2 days produced the highest number of flower buds while the plants watered every 4 days produced the least number of flower buds.

There was significant interaction between biol and biosol, on number of flower buds. The highest number of flower buds was produced by medium with 1:2 biosol X watered without bio, which produced similar number of flower buds with 1:8 biosol X no biol, 1:8 biosol X watering every 2 days, 1:4 biosol X no biol, 1:4 biosol X watered every 2 days, 3:8 biosol X watering with biol every 4 days and 1:2 biosol X watering with at 4 days and 2 days intervals.

Table 7: Effect of Biol and Biosol on the number of flower buds

Biosol [bs]	0	BIOL every 4 days	Every 2 days	2	Mean biosol
0 [1/8]	3.4	6.6	8.0		6.0
1 [1/8]	11.0	7.0	9.1		9.1
2 [1/4]	8.5	7.0	11.4		9.0
3 [3/8]	5.6	7.5	7.0		6.7
4 [1/2]	11.7	10.5	10.8		11.0
Mean biol	8.0	7.7	9.3		

LSD For 2 BS means [BS] = 2.80

LSD For 2 BL means [BL] = Ns

LSD For 2 BS X BL Interaction = 4.60

The highest stem dry weight was produced by medium 1:8 biosol which differ significantly with other media. The least stem dry weight was produced by the medium with no biosol. [Table 8]/

Biol did not significantly affect stem dry weight. The medium watered with biol every 2 days produced the highest stem dry weight while, plant watered with biol every 4 days produced the least stem dry weight.

There was significant interaction between biol and biosol. No biol X no biosol produced the least stem dry weight while 1:8 biosol X watering with biol every 2 days produced the highest stem dry weight.

DISCUSSION

Pot Marigold [*Tagetes erecta*] was successfully produced by the use of the organic fertilizer, biosol and biol. It seems as if Biosol alone is enough without addition of Biol. Vegetative growth of marigold was enhanced by increasing the amount of biosol added. However the highest level of biol with biosol was detrimental to flower production.

Hooda et al [1981] reported that every successful increase in organic matter level result in increased plant height and branches per pot. This is consistent with the result from this study because plants that contained 1:2 biosol was the pots with highest level of biosol, and plants watered with biol every two days produced the highest number of branches. Watering with biol at 4 days interval also contribute to the growth of plant branches [table1]

There was significant interaction between biol and biosol in regard to number of branches and flower dry weight, but there were no significant interaction on number of flower buds, stem dry weight and roots dry weight. The highest number of branches was recorded on medium with the highest quantity of biosol watering with biol every 4 days and the least number of branches was produced by the plants without biol and biosol. The highest number of flower buds was also produced by the medium with the highest quantity of biosol and without watering with biol. The least number of flowers was from the medium biosol and medium without biol.

Growth in 1:2 biosol and watering at 4 days interval with biol produced the highest plant height (Table 6), highest number of branches table 1 while flower dry weight table 2 was favoured by use of 1:4 biosol and watering at every two days interval. Stem girth was favoured by 1:2 biosol and watering at every 2 days interval (Table 4). Number of flowers per pot was favoured by use of 1:4 biosol and watering at every 2 days interval.

It is therefore suggested that use of biosol at the highest level and watering with biol at every 4 days interval can be used in pot flowers to produce good quantity plant

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