Performance of Vegetable Seedlings Raised In Jiffy 7C Pellets

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ABSTRACT

An experiment was conducted to investigate the growth performance of three types of vegetable seedlings of Brinjal, Tomato, and Capsicum grown in 5 different media and those were tested with and without foliar fertilizer applications. Results revealed that best growth performance was shown by soil and the second was coir pellets with 100% fertilizer increase. Application of foliar fertilizer was not effective. Hence, it is recommended that further studies should be carried out on field performance and yield after transplanting.

KEYWORDS: Vegetable Seedlings, Jiffy Pellets, Coir Dust, Soil, Foliar Fertilizer

INTRODUCTION

Next to rice, vegetables are the most important commodity in Sri Lankan diet. Total vegetable production in Sri Lanka is 525,157mt (Anon, 2002).The vegetables contribute 10% of the Colombo consumer price index (CCPI) which is an official measure of inflation in the country. Vegetables had also been identified as a commodity with potential for export.

Seedling stage is one of the critical stages for most vegetable crops. Poor seedlings may lead to poor field growth resulting poor yield. Therefore, it is important to maintain a vigorous seedling with a well grown root and shoot for successful establishment in the field or in a protected house. Though soil is common in Sri Lanka for nurseries, it may not be practical when crops are cultivated in protected houses. Therefore, suitable medium had to be identified for raising seedlings before they are transplanted.

In Sri Lanka the cheapest medium which can be used in vegetable production is coconut coir dust. While the fiber from the coconut husk is used for various products, the coir dust is mostly discarded and is available in abundance. In the last few years coir dust has been promoted or considered as substitute for natural peat in potting media. The particular structure of coconut fiber and their physical and chemical properties make them suitable for container media purposes (Batra, 1985). Many small scale green house farmers in Sri Lanka also use containerized or plug nurseries filled with coir-dust (Weerakkody, 2003).

Jiffy 7C pellet is a new product made out of compressed coir dust and it expands when water is applied. It is an aerated and easily drained coir substrate which has undergone chemical and structural modification with addition of fertilizer. Coir dust under normal conditions contains chlorides at levels toxic to many plants. In the process of pellet production excess chlorides are removed as $CaCl_2$ by adding $CaNO_3$. Pellets are enclosed in a netting film of non woven material, serving as an envelope for the substrate. This net allows root development of plant by allowing roots to penetrate and expand freely, while providing adequate strength for the root ball during handling and transplanting (Anon, 2005a).

Fast rooting, trouble free irrigation, better drainage properties, better air porosity are some expected advantages in pellets. It may also reduce transplanting shock of vegetable seedlings and contribute to better plant growth and yield. Therefore, the objective of this study was to evaluate the effect of Jiffy 7c pellets on growth performance of seedlings of three vegetable crops.

MATERIALS AND METHODS

The experiment was conducted at the Faculty of Agriculture and Plantation Management, Wayamba University of Sri Lanka, Makandura, Gonawila (Low Country Intermediate Zone) from April to June, 2005. Three vegetable types were tested. They were Capsicum (var.Hungarian Yellow Wax), Tomato (var.T-245) and Brinjal (var.Lena iri)

Five different media combinations were used to raise the seedling of above three crops. They are given below.

T_1. Normal Jiffy 7c pellets
T_2. Jiffy 7c pellets with 50% increase in fertilizer level
T_3. Jiffy 7c pellets with 100% increase in fertilizer level
T_4. Coir dust
T_5. Soil (standard field nursery) as control

Pellets and coir dust were kept in the trays and the trays were placed near the control treatment. The coir dust was treated with lime (50 g per 1000g of coir dust). Nursery management practices were done according to the recommendations of the Department of Agriculture (DOA).

One set of seedlings were treated with a foliar fertilizer (F_1) while the other set kept without any foliar fertilizer (F_0). 15 ml of Maxi crop mixed in 6 l of water was used as foliar fertilizer and applied once in 7 days during the nursery period.

The five treatments were arranged in split split plot design with 3 replicates. 20 seedlings from each

treatment combination were raised initially and 10 seedlings from each vegetable type were used to record data. Data on germination percentage, survival percentage were taken initially. Plant height (cm), leaf area (cm^2), shoots dry weight, and root dry weight was recorded when the seedlings were ready for field transplanting (Tomato after 3 weeks, capsicum and Brinjal after 4 weeks). All data were analyzed using the SAS statistical software package (SAS, 1998).

RESULTS

a. Germination percentage

Table 1 gives the germination percentages for 3 vegetable types, recorded 12 days after sowing. It is clear from the results that lowest germination percentages were observed in T_4. All other treatments gave significantly higher germination percentage over coir dust. The performance of three types of pellets had little significance over control treatment, soil. However, in Brinjal soil recorded a higher (approx. 10%more) germination percentage over three types of pellets. The differences observe among the three different pellets (T_1, T_2, and T_3) for three vegetables did not show significant variation (Table 1).

Table 1. Germination percentages of Capsicum, Brinjal and Tomato seedlings 10 days after sowing.

	Germination percentage		
Treatment	Capsicum	Brinjal	Tomato
T_1	73.75 a	52.90 a	64.16 a
T_2	71.66 a	54.16 a	70.70 a
T_3	68.30 a	54.96 a	65.33 a
T_4	41.00 b	36.23 b	40.20 b
T_5	71.00 a	65.00 c	69.30 a
CV	11.06	8.05	5.87
LSD	13.27	6.61	7.75

Treatment means in a column having common letters are not significantly different at p=0.005

b. Survival percentage

Although the germination percentage was poor in T_4, the survival percentages of germinated seeds were as good as in other treatments. However, the seedlings grown in soil had significantly higher survival rate than other four treatments in all three crops. Yet the differences were approximately 8-10% (Table 2).

c. Growth performances

i. Seedling height

Significantly higher seedling height was observed in all control treatments over others. The treatment with coir dust (T_4) gave significantly lowest values for three crops under two foliar fertilizer levels (Table 3). It was also evident that the three types of pellets (T_1, T_2, T_3) with different fertilizer levels, did not show significant differences except for capsicum, where three pellets along with foliar fertilizer gave significantly different values for seedling height, T_3 giving higher than T_2 and T_1. Even in other two crops, though the differences were not significant, T_3 had higher values than T_2 and T_1. The seedlings grown in soil had higher values and could be attributed towards better root growth and distribution enabling the seedling to absorb more nutrients from the soil for its growth, whereas for seedlings grown in pellets and coir dust had smaller area for roots to grow and absorb nutrients.

Table 2. Survival percentages of Capsicum, Brinjal and Tomato seedlings recorded 2 weeks after germination.

Treatment	Survival percentage		
	Capsicum	Brinjal	Tomato
T_1	91.36 a	89.33 a	93.53 a
T_2	93.63 a	89.70 a	93.36 a
T_3	92.66 a	91.50 a	92.86 a
T_4	91.33 a	90.16 a	91.58 a
T_5	100.00 b	98.93 b	99.50 b
CV	3.52	4.34	1.76
LSD	6.01	7.2	3.02

Treatment means in a column having common letters are not significantly different at p=0.05

Table 3. Seedling height (cm) of Capsicum, Brinjal, and Tomato recorded 3-4 weeks after sowing.

Treatment	Seedling height (cm)		
	Capsicum	Brinjal	Tomato
F_0T_1	4.67 ab	3.64 a	5.26 ab
F_0T_2	5.78 a	3.42 a	5.82 ab
F_0T_3	5.79 a	3.54 a	6.77 a
F_0T_4	2.61 b	2.27 b	2.64 b
F_0T_5	13.86 c	16.7 c	11.16 c
CV	20.14	2.84	22.6
F_1T_1	4.82 a	3.55 a	5.73 a
F_1T_2	5.53 b	3.58 a	5.22 a
F_1T_3	6.39 c	3.90 a	6.00 a
F_1T_4	2.50 d	2.03 b	2.79 b
F_1T_5	16.31 e	14.70 c	10.88 c
CV	1.89	11.66	7.16

Treatment means in a column having common letters are not significantly different at p=0.05
F_0 – Treatment without foliar fertilizer application
F_1- Treatment with foliar fertilizer application

ii. Leaf area

A trend similar to seedling height was observed for leaf area .It was evident that control treatment soil, recorded significantly highest values for leaf area in three crops ,while coir dust proved to be the poorest treatment showing lowest values for all crops at two different foliar fertilizer levels. Out of the three pellet treatments, T_3 proved to be more vigorous than T_1 and T_2. However the T_1, T_2 and T_3 did not show significant differences except for T_2 with foliar fertilizer of Tomato which showed significantly lower value than T_1 and T_3.These results further indicate that seedlings grown in a normal nursery have the ability to produce more vigorous seedlings when compared to other treatments.

iii. Shoot dry weight

Significantly higher values for shoot dry weight were observed for T_5 of all crops under both fertilizer

treatment levels (F_0 and F_1). Lowest values were observed for coir dust treatment, while all pellets showed similar values except for Capsicum, where significant differences were observed even among pellets (T_1, T_2 and T_3) under both fertilizer application levels (F_1, F_0).The value obtained for T_5 were much higher than other treatments.

Table 4. Leaf area (cm2) of Capsicum, Brinjal, and Tomato seedling recorded 3-4 weeks after sowing

Treatment	Leaf area (cm^2)		
	Capsicum (4w)	Brinjal (4w)	Tomato (3w)
F_0T_1	11.01 a	13.39 a	8.69 a
F_0T_2	11.07 a	15.04 a	9.71 a
F_0T_3	15.90 a	16.65 a	12.31 a
F_0T_4	1.64 b	0.78 b	0.90 b
F_0T_5	42.36 c	171.16 c	35.50 c
CV	24.26	12.7	13.91
F_1T_1	8.49 a	13.16 a	11.27 a
F_1T_2	14.30 a	13.65 a	8.47 b
F_1T_3	11.80 a	15.48 a	13.10 a
F_1T_4	0.84 b	0.80 b	0.87 d
F_1T_5	46.82 c	182.92 c	36.48 c
CV	16.06	7.33	4.22

Treatment means in a column having common letters are not significantly different at p=0.05

Table 5. Shoot dry weight (g) of capsicum Brinjal and Tomato seedlings recorded 2-3 weeks after sowing

Treatment	Shoot dry weight (g)		
	Capsicum (4w)	Brinjal (4w)	Tomato (3w)
F_0T_1	0.033 a	0.062 a	0.036 a
F_0T_2	0.047 a b	0.071 a	0.033 a
F_0T_3	0.062 b	0.088 a	0.044 a
F_0T_4	0.004 c	0.004 b	0.002 b
F_0T_5	0.143 d	0.656 c	0.120 c
CV	15.66	24.66	20.58
F_1T_1	0.031 b	0.046 a	0.036 a
F_1T_2	0.058 a	0.063 a	0.030 a
F_1T_3	0.053 a	0.080 a	0.042 a
F_1T_4	0.002 c	0.016 b	0.004 b
F_1T_5	0.187 d	0.648 c	0.113 c
CV	15.24	15.54	13.36

Treatment means in a column having common letters are not significantly different at p=0.005

iv. Root dry weight

When compared to the differences observed under previous characteristics, the root dry weight recorded for T_5 treatments were much lesser. Capsicum seedlings grown without foliar fertilizer did not show a significantly different value. Even among Pellets, except for capsicum, all other treatments had no significant differences (Table 6).

Table 6. Root dry weight (g) of Capsicum, Brinjal and Tomato seedlings recorded 3-4 weeks after sowing

Treatment	Root dry weight (g)		
	Capsicum (4w)	Brinjal (4w)	Tomato (3w)
F_0T_1	0.014 a	0.025 ab	0.009 a
F_0T_2	0.021 a	0.024 b	0.011 ab
F_0T_3	0.024 a	0.034 a	0.034 b
F_0T_4	0.024 a	0.001 d	0.010 a
F_0T_5	0.015 a	0.048 c	0.012 ab
CV	11.24	17.4	19.44
F_1T_1	0.013 a	0.021 b	0.006 a
F_1T_2	0.024 b	0.029 a	0.007 a
F_1T_3	0.021 d	0.028 a	0.007 a
F_1T_4	0.002 c	0.001 c	0.001 b
F_1T_5	0.020 b	0.045 d	0.011 c
CV	7.08	13.07	18.58

Treatment means in a column having common letters are not significantly different at p=0.005

DISCUSSION

In this experiment damping off was observed both in pellets and in normal coir dust. This may be due to retention of water at the bottom of the trays. Further, soil has capacity of retaining nutrients (Brady, 1998). However, coir has a low cation exchange capacity (21-30 meq/L0), and it does not retain cations (Handreck, 1993). So added fertilizer into pellets may get leached away.

The results of this study clearly indicate that seeds sown in soil give rise to more healthy and vigorous seedlings. However, seedlings grown in soil may not be feasible or practical for use in protected agricultural practices or when grown under adverse climatic conditions. Therefore, raising seedlings in pellets is common in modern agriculture due to its easy handling, management and to reduce shocks at the time of transplanting.

In comparison with other soil less growing media, pellets are environmental friendly, as both coir and its covering material are biodegradable. Seedlings grown in soil, face root damages and transplanting shock at the field establishment, while pellet grown seedlings are completely free from this. Among the pellets, T_3, has shown better performance than other two types.

CONCLUSIONS

The study reveals that seeds germinate well in all selected media except in normal coir. Performance of growth parameters of seedling stage is higher in soil. Though the effects of three pellets on seedling growth and vigour were not significantly different, the T_3 gave better performance than others.T_3 with several other fertilizer combinations in pellets, can be recommended for further studies. Performance after transplanting should also be studied and monitored, with special emphasis on growth of the root system.

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