

DIFFERENT CULTURE MEDIA USED FOR LOW SCALE PRODUCTION OF SOME COMMON MICROGREENS

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Abstract

Microgreens are nutritious greens gaining popularity nowadays. It is used as source of food supplement in daily life. The rapid increase occur in the popularity of the cultivation of microgreens in the recent years. Common plants like leguminous plants and vegetable seeds are selected for low scale production. Major advantages of microgreen production is it can grow by indoor method. They are popular for their easy production, quick response to the growth mediums, availability and of low cost. Our study is focussed on the low scale production of some common microgreens using different growth media.

Key words: Microgreens, Indoor cultivation, Growth media.

Introduction

Microgreens are miniature versions of edible plants, produced from seeds. It is a complete nutrient rich from shoot to leaf and healthy greens that can be consumed without any side effects. It is a source of vitamins and minerals. The term “microgreens” lack legal definition but it is a marketing term that are used for describing some vegetables products (Treadwell *et al* 2010) Microgreen cultivation is done both indoor and outdoor method. Indoor method is most convenient for both care and harvest. Microgreens provide high concentration of vitamins and minerals which are linked with the promotion of human health (Ahmad *et al.*, 2016). Although its used as garnish in dishes it is gaining popularity nowadays due to its increased nutrition content comparing fully grown leaves of same plants. Microgreens can grown in a standard, sterile, loose soil and many mixes have been used successfully with peat, perlite, vermiculite and bark (Kou *et al.*, 2013). Different media used for cultivation is helped to find out the best media for good growth response. Harvested microgreens are highly perishable, shelf life of microgreens depend on many factors such as temperature, rela-

tive humidity, packaging film type and microbial load (Hodges and Toivonen., 2008). Microgreens study was initiated with objective of finding good medium and harvesting time variation in different mediums.

Materials And Methods

Microgreens can thrive well in indoor and outdoor and are even manageable in rooftops and easy to handle without any prior knowledge. Microgreens production require some materials that includes:

Container/Trays

A surface is required for the microgreens to grow well. Trays with holes are usually selected, for giving importance to good drainage. Flat trays or plastic trays like biscuits or cake boxes can be utilized or collected from stores.

Growing media for microgreens vary from soil to paper and can be grown most comfortably in any media. Soil is mostly opted as a convenient medium, as it is easily available and further preparation for the medium is not required.

Coco peat, source of many nutrients, is also a good media cheaply available. Water work best

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for indoor cultivation as it is easy for handling and the seeds can grow well in it.

Water

Water is an essential component for microgreens cultivation in any media. Microgreens are sprayed with water daily. A sprayer is used to avoid the over flood of water and rotting of the plant. Instead of chlorinated water ,tap water is used.

Light

Sunlight is required for growth of plants, but for microgreens direct sunlight is not essential as they are mostly grown in indoor. But there presence increase the yield and health of greens.

Seeds

For microgreen cultivation chemically treated seeds must be avoided and seeds from kitchen garden or online store can be make utilized. Mostly bean seeds are used ,as it shows high response and yield.

Methods

Microgreens are easy to grow in any media with minimum materials. However, growing of microgreens in different media shows different response and yield.

Microgreens growing in soil medium

Soaked seeds are sowed in the container, after filling the tray with soil up to certain height . Seeds show response within 2 days by sprouting. Soil medium is suitable for indoor and outdoor cultivation. Seeds are sprayed with water daily. First leaves appear within a week and greens can be harvested after they reach maximum of green height.

Microgreens growing in water medium (hydroponics)

Water medium is the cleanest and easiest medium to grow microgreens efficiently. Soaked seeds are placed in the holed first trays and water is placed below the first tray in another tray. Seeds show germination within 2 days and can

be harvested soon. Water in the second tray is to be changed once within 2 days. It is one of the best way to grow microgreens indoor without sunlight.

Microgreens growing in coco peat medium

Coco peat being an easily available medium, microgreens can be grown easily and cheaply in it without adding any other nutrients. Soaked seeds sowed in coco peat medium show germination within days and are harvested with good yield. Water is sprayed daily to maintain moisture.

Microgreens growing in coco peat and soil medium

Coco peat and soil together make a good combination for growing microgreens. Soaked seeds sowed in the coco peat and soil medium mixture show quick response in germination and yield. Greens are watered daily. Best way to grow our own food with cheapest medium available.

Result And Discussion

Microgreens cultivation considered unique as it make use of only limited space, equipment and produce high yields within it. Seeds of Mung bean, Adzuki bean, Chick pea, Coriander, Fenugreek, Spinach, Mustard were sown to analyse their response in the different medium. Seeds were totally fit in the soil environment thus, response was quick comparing other mediums and yield were satisfactory. In soil medium, bean microgreens shown fast growth rate and the slow growth rate was of fenugreek,mustard with 25%(poor yield) and 55% (medium yield). Coriander and spinach, shown medium growth rate with 40%(low yield) and 60%(high yield). While chick pea shows medium growth rate with low yield of 35%. Germination time start within 4 days and harvesting time ended within 17 days. Mustard and Fenugreek shown longest germination period and mustard, fenugreek, spinach shown longest harvesting time period. In water medium, bean microgreens shown fast growth rate with minimum of 70% yield, while chick pea shows low

yield of 35 % with medium growth rate. Fenugreek show the slow growth rate with 15% (poor yield). Coriander, spinach, mustard shown medium growth rate with 30% (low yield),60%(high yield),65% (high yield) yields. Germination time start early for beans and late for Fenugreek, spinach, mustard and harvesting time ends within 16 days. Fenugreek, mustard, spinach shown longest germination time and fenugreek, mustard shown longest harvesting time. In coco peat medium, bean microgreens shown fast growth rate with 65%(high yield) , while chick pea shows medium growth rate with medium yield of 55%. Slow growth rate shown by fenugreek and mustard with 30%(low yield)and 70%(high yield).Even though growth rate was slow for mustard they shown high yield comparing other slow growth seeds. Germination time started within 3 days and take long for mustard and coriander. Harvesting time start within 9 days and take long for mustard, coriander and fenugreek. In a mixture of coco peat and soil medium, almost all greens shown high yields except fenugreek. Bean microgreens shown high growth rate with high yield of 75% and slow growth rate and poor yield was shown by fenugreek. Coriander, spinach and mustard shown medium growth rate with a minimum of 50 % and maximum of 65% yield. Thus overall results shows that soil as the good medium shown quick response and beans as the best microgreens with fast growth rate and higher yield and combination of coco peat and soil medium as the high yield producing medium.

Table 1. Response of microgreen seeds sown on soil medium

<u>Sl. No</u>	<u>Common name</u>	<u>Scientific name</u>	<u>Germination time</u>	<u>Harvesting time</u>	<u>Medium</u>	<u>Response</u>	<u>Yield</u>
1.	Mung bean	<i>Vigna radiata</i>	4-6 days	10-14 days	Soil	Fast growth rate	High yield (60 %)
2	Adzuki bean	<i>Vigna angularis</i>	5-6 days	12-14 days	Soil	Fast growth rate	High yield (65 %)
3	Chick pea	<i>Cicer arietinum</i>	6-8 days	14-17 days	Soil	Medium growth rate	Low yield (35 %)
4	Coriander	<i>Coriandrum sativum</i>	6-7 days	10-14 days	Soil	Medium growth rate	Low yield (40 %)
5	Fenugreek	<i>Trigonella foenum-graecum</i>	6-9 days	14-17 days	Soil	Slow growth rate	Poor yield (25%)
6	Spinach	<i>Spinacia oleracea</i>	4-6 days	11-15 days	Soil	Medium growth rate	High yield (60%)
7	Mustard	<i>Brassica juncea</i>	8-11 days	15-16 days	soil	Slow growth rate	Medium yield (55%)

Table 2. Response of microgreen seeds sown on water medium

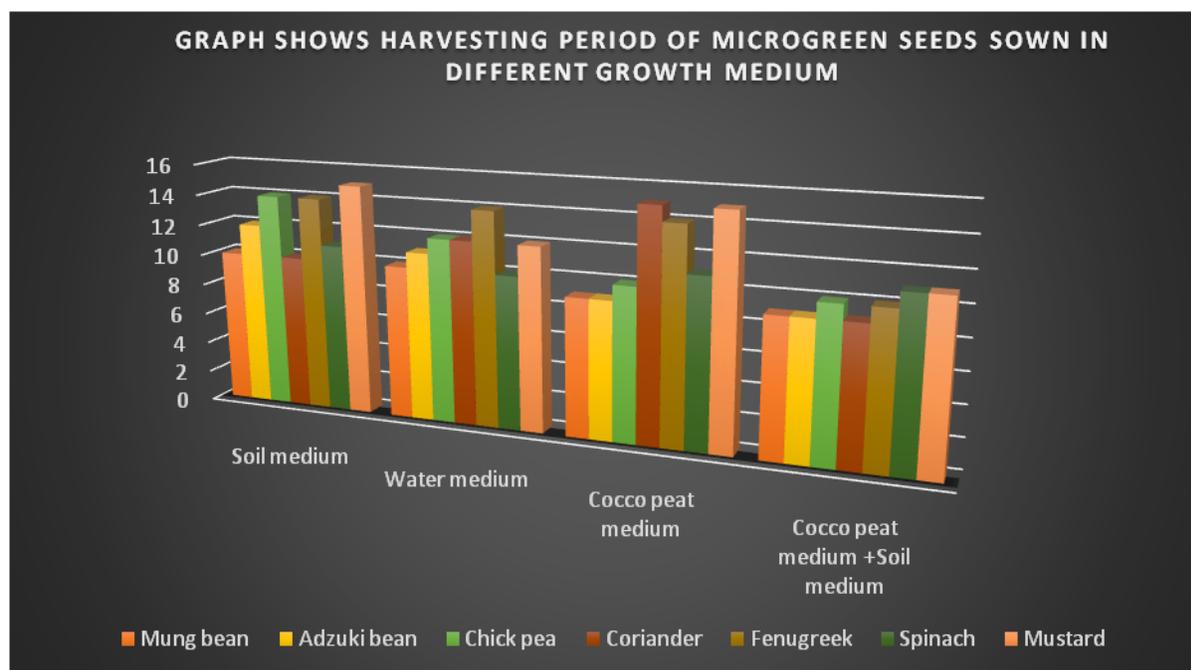
SI. No	Common name	Scientific name	Germination time	Harvesting time	Medium	Response	Yield
1.	Mung bean	<i>Vigna radiata</i>	3-4 days	10-13 days	Water	Fast growth rate	High yield 75%
2	Adzuki bean	<i>Vigna angularis</i>	2-3 days	11-14 days	Water	Fast growth rate	High yield 70%
3	Chick pea	<i>Cicer arietinum</i>	5-7 days	12-14 days	Water	Medium growth rate	Low yield (35%)
4	Coriander	<i>Coriandrum sativum</i>	2-4 days	12-14 days	Water	Medium growth rate	Low yield (30 %)
5	Fenugreek	<i>Trigonella foenum-graecum</i>	7-8 days	14-16 days	Water	Slow growth rate	Poor yield (15 %)
6	Spinach	<i>Spinacia oleracea</i>	7-9 days	10-13 days	Water	Medium growth rate	High yield (60 %)
7	Mustard	<i>Brassica juncea</i>	7-10 days	12-15 days	Water	High growth rate	High yield (65%)

Table 3. Response of microgreen seeds sown on coccopeat medium

SI. No	Common name	Scientific name	Germination time	Harvesting time	Medium	Response	Yield
1.	Mung bean	<i>Vigna radiata</i>	3-4days	9-11 days	cocco peat	Fast growth rate	High yield (65%)
2	Adzuki bean	<i>Vigna angularis</i>	4-5 days	9-12 days	cocco peat	Fast growth rate	High yield (65 %)
3	Chick pea	<i>Cicer arietinum</i>	6-7 days	10-14 days	cocco peat	Medium growth rate	Medium yield (55 %)
4	Coriander	<i>Coriandrum sativum</i>	6-9days	15-17 days	cocco peat	Medium growth rate	Low yield (30 %)
5	Fenugreek	<i>Trigonella foenum-graecum</i>	6-9 days	14-17 days	cocco peat	Slow growth rate	Low yield (30 %)
6	Spinach	<i>Spinacia oleracea</i>	4-6 days	11-15 days	cocco peat	Medium growth rate	High yield (75 %)
7	Mustard	<i>Brassica juncea</i>	6-10 days	15-16 days	cocco peat	Slow growth rate	High yield (70%)

Table 4. Response of microgreen seeds sown on cocco peat medium +soil medium

Sl. No	Common name	Scientific name	Germination time	Harvesting time	Medium	Response	Yield
1.	Mung bean	<i>Vigna radiata</i>	3-4 days	9-13 days	cocopeat medium+Soil medium	Fast growth rate	High yield (75%)
2	Adzuki bean	<i>Vigna angularis</i>	3-5 days	9-14 days	cocopeat medium +Soil medium	Fast growth rate	High yield (75 %)
3	Chick pea	<i>Cicer arietinum</i>	4-6 days	10-12days	cocopeat medium +Soil medium	Medium growth rate	Medium yield (55 %)
4	Coriander	<i>Coriandrum sativum</i>	2-4 days	9-12 days	cocopeat medium +Soil medium	Medium growth rate	Medium yield (50 %)
5	Fenugreek	<i>Trigonella foenum-graecum</i>	4-6 days	10-12 days	cocopeat medium +Soil medium	Slow growth rate	Poor yield (30 %)
6	Spinach	<i>Spinacia oleracea</i>	3-5 days	11-13 days	cocopeat medium +Soil medium	Medium growth rate	High yield (65 %)
7	Mustard	<i>Brassica juncea</i>	4-6 days	11-15 days	cocopeat medium +Soil medium	High growth rate	High yield (65%)



Discussion

Microgreens are a good nutrient supplement that can be produced at low cost, mostly used legume seeds and vegetable seeds for culture. They are cultivated at different growth medium. here response and yields also varies. The microgreens shows independent growth rate and yield. Growth rate and yield is not same for the seeds in all medium. Mostly, bean microgreens shown high response in all aspects and were quite successful in all medium with high yield. Nowadays humans are lack of nutritious items in their food cause deficiency diseases which make them unhealthy. In such circumstances we can make use of microgreens as food supplement that can be cheaply produced through indoor method. Microgreens are considered as the young edible seedlings that are produced by using seeds of vegetables and edible herbaceous plants

Although its cultivation seems to be quite interesting in every aspect, there are certain factors that badly affect the growth and health of greens like temperature, overcrowding of greens, chemically treated water, infected seeds etc., if not properly taken care. These factors can adversely affect the healthy microgreens and thereby affect the growth of the greens. Even microgreens is easy to handle, care should be taken to avoid rotting of seed and greens due to over flood of water and diseases. Some of the disease symptoms shown by microgreens include thin shoots, poorly developing leaves, whitish appearance on the sprouting seeds and developing greens. Different trials at different medium shows change in the yield during harvesting time. During the production of greens and the yield variation can be used to identify the best medium suitable for growth. Although same seeds are sown in different medium, appearance of green may change both indoor and outdoor. At outdoor condition more sunlight absorbed but it have a chance of soil born microbes attack. Microgreens cultivation gives a great opportunity for local people in field of business. As the marketing of greens are in-

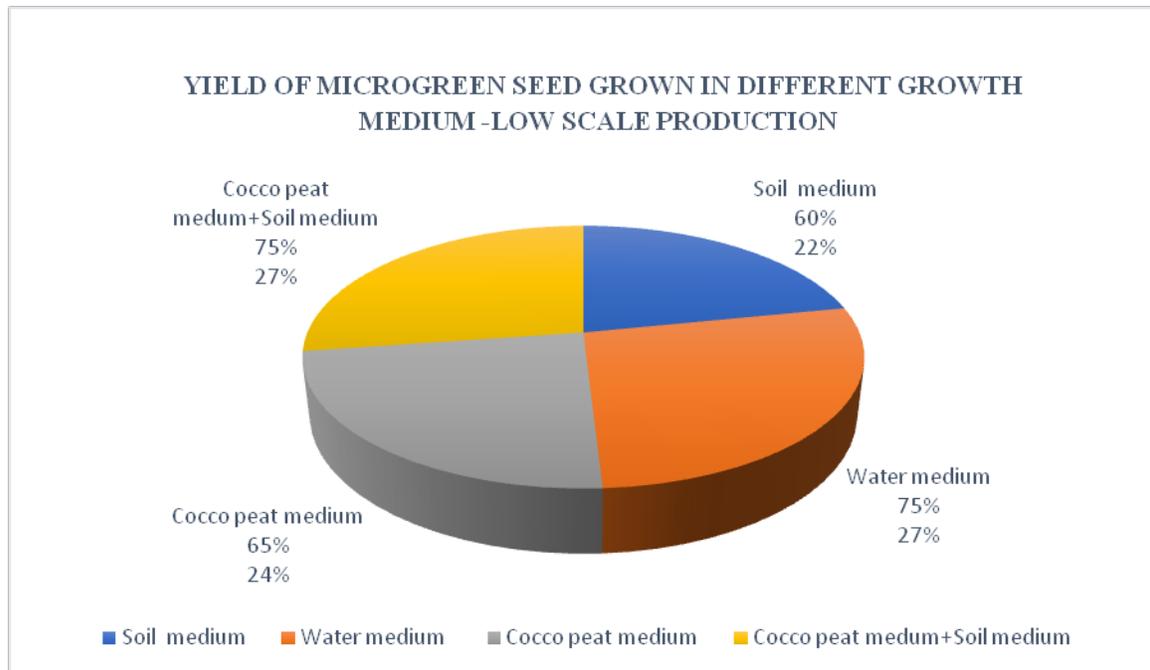
creasing day by day and its usage is also increasing. Usually harvesting of green is based on the length and appearance. Almost 2 inch tall greens are ready to be harvested and they can be trimmed by using kitchen knife or scissors. Greens after washing and can be stored securely in containers for about 5 days. Long time storage is not acceptable for microgreens, so using it early is good for having fresh greens. Microgreens are a new class of edible vegetables, a very specific type which includes seedlings of edible vegetables, herbs or other plants, ranging in size from 5 to 10 cm (Xiao *et al.*, 2012).

Conclusion

Microgreens are the very popular leafy green. Mostly leguminous and vegetable seeds are selected for house hold production. In our study we used four medium for propagation such as soil, water, cocopeat and cocopeat mixed with soil medium. The germination time and harvesting are different in different media. In our studies we selected seven different seeds. The seeds that are sown in four different growth medium and the daily response are recorded. This studies resulted that high yield and short period of harvesting are in cocopeat medium mixed with soil and water medium only compare to other two medium such as soil medium and watermedium. From our study based on different media. We recommend cocopeat mixed with soil medium as the best media for microgreen production and bean microgreens as the best green that show quick response and healthy yield. Through this study we find out the best media that can be used for microgreen production and the variation in harvesting time of the greens.

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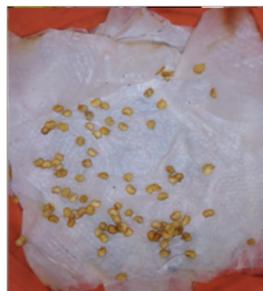
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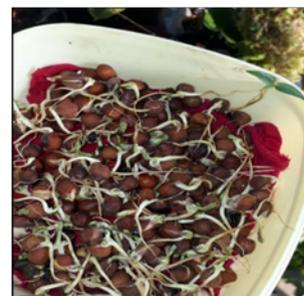
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e

Figure a. Seeds are sown in soil medium, **Figure b.** Seeds are sown in cocco peat medium, **Figure c.** Seeds are sown in soil medium show germination, **Figure d.** Seeds are sown in water medium, **Figure e.** Chick pea seeds are sown in water medium shows germination



f



g



h



i



j



k



l



m



n

Figure f. Mung bean are germinated in water medium, **Figure g.** Coriander seeds are germinated in coco-peat medium, **Figure h.** Adzuki bean seeds are sown in coco-peat + soil medium show rapid germination, **Figure i.** Fenugreek grown in soil medium, **Figure j.** Adzuki bean seeds are grown in soil medium, **Figure k.** Chick pea grown in coco-peat + soil medium. **Figure l.** Mung beans show fast germination in water medium, **Figure m.** Mung beans ready for harvesting, **Figure n.** Chick pea seeds are sown in coco-peat + soil medium show good response.



o



p



q



r



s



t

Figure o. Spinach are germinated in soil medium, **Figure p.** Mustard seeds are germinated in water medium, **Figure q.** Mustard greens are ready for harvesting. **Figure r** and **Figure t.** Harvested mustard greens, **Figure s.** Mustard seeds are germinated in water medium

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