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STUDY ON SAFE SPROUT PRODUCTION PROCEDURE

Nguyen Cong Thanh[1], Nguyen Huu Minh[1], Tai Đai Thanh[2] and Nguyen Van Ngau[2]

[1] Cuu Long Delta Rice Research Institute, Can Tho, Viet Nam (CLRRI)
[2]Department of Science and Technology of Haugiang Province, Vietnam

ABSTRACT

The sprout production for supplying nutrition, vitamins and necessary elements to improve health and to prevent diseases for human has been concerned for long time in the developing countries. Their sprouts are diversified, high values and produce in the modern conditions. For our country, in the recent years, the economy has been improving, so, the demand for nutrition has changed i.e. ensuring diversification and safety for human's health. Since then, sprouts become more and more concern by the consumers. The production is multiple and diversified day by day. The sprouts usually grow on the growing mediums such as clean soil, coconut fiber…However, these growing medium are not cheap and not available everywhere as compare to rice husk ash. Therefore, the study aims at firstly, building the procedure for sprout production with safety standards, following VietGAP regulation; secondly, finding out the new growing medium – rice husk ash – to change normal growing medium with rarely and costly and to gain more convenient. The results of study indicated that the sprouts grow on the rice husk ash and coconut fiber gave highest yields, which significantly differed at 5% degree of probability as compared to other growing mediums used in this study. The highest return was also got at rice husk ash treatment (VND 288,600 /1kg of seed), followed was coconut fiber treatment (VND 242,600 /1kg of seed). From the findings, it can conclude that rice hush ash can use to grow sprouts in the interchange with other mediums. Rice hush ash is available everywhere in the Mekong Delta, free of cost or cheap and easy to use for sprout production. Application this procedure can be gained clean and safe products, high yield and return.

INTRODUCTION

Everybody recognize that eating vegetables are good for human health. Vegetables can also enhance the capacity to prevent diseases due to the lack of some important nutritional elements. Sprouts are one kind of high-grade of vegetables, mostly producing from the seed in very short time (1 – 5 days). Depend on requirement; it produces in some days for eating small bud sprouts. For eating germinating seeding, it can produce from 4-6 days. Therefore, sprouts can easily become safe and clean vegetables due to produce with fresh water, without fertilizers, pesticides, and stimulating materials. However, it needs clean seed without residual materials harmful to the human. The seed should be bought in reliable companies along with transparent certificate. In addition, sprouts should produce with clean water (not canal water, underground water). Clean growing medium is also required. After that, the sprout products have to gain clean vegetable certificate following VietGAP standard (Ministry of Agriculture and Rural Development 2007). Then, it is not so easily to produce clean sprouts. Therefore, the magazine Vegetables Nutrition Guide (2010) wrote that thus, making it harder and harder to have healthy vegetable nutrition based diet. While getting organic seed and controlling the sprouting environment we know exactly what we get, and that is great!

The benefits of sprouts for human health can list in seven benefits as follows:

(i). *Sprouts contain oxygen.* Because sprouts are a 'living' food, they contain hundreds of molecules of oxygen, which is essential for healthy cells.

(ii). *Sprouts have an alkalizing affect on the body.* Your body needs to be alkaline in order to be healthy. Several foods and toxins can offset this balance. Sprouts are very alkaline, so you will be helping your body achieve balance with ease.

(iii). *Sprouts contain healthy fats.* Sprouts contain EFAs, the essential fatty acids your body needs to perform basic body functions. You need a certain level of fat in your diet in order to ward off infections and strengthen your immune system. Sprouts are rich in EFAs, so they can support a healthy diet and keep your metabolism functioning at its optimal level.

(iv). *Sprouts are natural sources of fiber.* Fiber helps keep your digestive system healthy, and helps you feel fuller between meals. Eating more fiber can support your healthy diet and reduce the risk of constipation. Loading up your sandwich or a meal with sprouts can give your daily fiber counts a boost, and help you digest your meal easily.

(v). *Sprouts can give you a dose of vitamins B and C.* Sprouts contain a number of vitamins and minerals, and the quantities are even greater when you soak the seeds overnight. Soaking the seeds overnight increases the levels of vitamin B, so you will always be doing your body a favor by doing this.

(vi). *Eating sprouts increases your protein count.* Sprouts contain a significant amount of vegetable proteins, and can support your healthy diet. They can even be a healthy alternative to meat, so if you are vegetarian, sprouts should be a part of your daily or weekly diet!

(vii). *Sprouts are very low in calories.* If you are watching your weight and cutting back on calories, sprouts will support your lifestyle. Sprouts contain only 9 calories per ounce, and these are a combination of healthy carbs, protein, and healthy fats. (www.divavillage.com, 2010).

Nguyen Chinh (2009) quoted from authors in USA, which found that some kinds of sprouts could help to prevent cancer diseases. According to website www.healingdaily.com (2009), researchers at Johns Hopkins University School of Medicine have discovered that 3-day old broccoli sprouts have exceptionally high amounts of a natural cancer-fighting compound. For many years, scientists have known that vegetables in the cabbage family benefit health. Recently, they have been successful in drilling down further to uncover those benefits, and the reasons why eating such foods can reduce the risk of disease. Dr. Paul Talalay and his colleagues, researching this question for over 20 years, showed that some varieties of vegetables such as broccoli contain high amounts of a substance called 'sulforaphane' which helped support antioxidants, such as vitamins C and vitamin E. This is another example of the synergy, which we often find in nature.

Outside of the above benefits, growing sprouts can help people to use spare time at home with self-support, creating work and the pleasure for family members, especially for older people, and improving green environment in the house.

In the developing countries, sprouts are diversified, high values and produce in the modern conditions. In Vietnam, the demand for nutrition with diversification and safety for human's health in recent years has become more and more concern by the consumers.

Therefore, the study conducted with two objectives: firstly, to build the procedure for sprout production with safety standards, following VietGAP regulation; secondly, to find out the new growing medium to change normal growing medium but rarely and costly and with other benefits.

MATERIALS AND METHODS

1. Materials:

- Seed of sprout: seed of white radish
- 06 kinds of growing mediums: fresh water, tissue paper, clean sand, rice husk, rice husk ash, and coconut fiber.
- Spongy tray (18 trays)
- Hand sprayer, scissors, plastic boxes…

2. Method of experiment:

- Experimental design: design the experiment in the lab of Cuu Long Delta Rice Research Institute, following Randomized Completed Block Design. Each treatment placed on a plastic tray, having the area of 0.2 m^2 (40 cm x 50 cm). Total trays were 18.
- Number of replications: 3
- Number of treatments were 6 (see in Table 1).

Table 1. Experimental treatments

Sign of treatments	Growing mediums
T1	Fresh water
T2	Tissue paper
T3	Clean sand

Sign of treatments	Growing mediums
T4	Rice husk
T5	Rice husk ash
T6	Coconut fiber

3. Observation and evaluation:

- Height of sprout on different growing mediums
- Sprout yield of each treatment
- Economic effectiveness on every treatment.

4. Method of measuring the data:

- Observation and remarks
- Pull the sprout at 5 days of old (and use ruler with degrees of cm and mm to measure the height).
- Cut the root of sprout, and wash carefully to eliminate the impurities, and then use the electric balance to measure the real yield.

5. Growing sprout procedure:

+ ***Seed preparation:*** The experiment used seed of white radish ensuring dry and quite plump; the germination was above 90%.

The source of seed ensue transparent certification and growing follows VietGAP standard. (Seed of experiment from Phuong Thanh Company). The seed does not treat with any chemical and just soak in the fresh water before eliminate unfilled seed and impurities.

Seed can be soaked from 8-12 hours (it is better to soak in the warm water (45^0C); the seed can uptake enough necessary water for germination. Then, take the seed out and incubate in the cloth to keep it warm easy for germination. The time for incubation was about 12 hours. It should be careful to check humidity, temperature and the situation of germinating seeds in this time.

+ ***Growing medium preparation:*** The growing medium can use some kinds in this experiment. We can treat growing medium free of germ before sowing by calcium-water solution with 5% concentration in some 2 hours.

+ ***Growing tray preparation:*** There are many kinds of growing tray such as plastic, spongy, metal tray…In this experiment, we used plastic tray with the size 40 x 50 x 7cm ($0.2m^2$). This kind of tray was easily used and favorable.

Put a layer of growing medium inside the tray with the height about 2 – 3 cm. Use the small ruler to level the surface of the growing medium, after that cover it by net cloth (not to cover by tissue paper to ensue safety). The net cloth helps harvest sprout easily, quickly and economically because it can reuse after washing and boiling.

+ ***Sowing:*** Use the germinating seeds to sow uniformly on the net cloth, then use the hand sprayer to irrigate for enough humidity all the seeds and growing medium to enhance the growth of the sprouts.

Place the trays into the file and cover them after each time of irrigation. This covering keeps about 3 days, after that opens them and put inside the room with fresh air condition. Ensure the degree about 25^0C. Does not place the trays in the open-air and avoid the sunshine directly.

+ ***Management:*** Keep irrigating water every day about 3 times to get enough humidity for sprouts growth. Use fresh water from the house. Do not use water from canal, underground water, waterspout because these water are not clean and contain more metal elements, chemical residues…

Keep water regularly 3 times per day to remain enough humidity for good growth, do not irrigate too wet to avoid the sprouts waterlogged or irrigate not enough the humidity for the sprout growth.

Do not apply any fertilizer, chemical, foliar fertilizers, regulating and stimulating regulator or stimulator to make sure the sprout clean and safety.

Keep the tray in airy place, enough the light and avoiding direct sunshine, rain and win. Avoid mouse and insect pest destroy the sprouts.

One day before harvest, reduce water or stop irrigation.

+ ***Harvest:*** After grow about 5 days, sprouts gained the height from 12 to 15 cm and above, we could harvest.

Depend on customers or market requirement we can uproot and keep the root along with sprout to sell or consumption.

If the market require, we can remove root by using the scissors or knife to cut them close to the

growing medium surface. Otherwise, we can uproot them and cut only the roots.

+ ***Storage the sprouts:*** Sprout products usually contain in the plastic boxes about 100, 200 or 300g depending on the requirement. The time for storage was not more than 5 days keeping in the cooling compartment not in the ice compartment of freezer or container.

6. Statistical method of data

The data of the experiment have analyzed by using the MS Excel and IRRISTAT 5.0 following Duncan testing method. Use the rule of three to convert the real sprout yield to conversion yield/1kg of seed for every treatment.

RESULTS AND DISCUSSION

1. Effect of the growing mediums on growth and yield of sprouts:

The stem height and yield of sprout measured on different growing mediums have shown in the Table 2 below:

Table 2. Effect of the growing mediums on growth and yield of sprouts

SN	Treatments	Height of sprouts (cm)	Conversion yield (kg sprout/kg of seed)
T1	Fresh water	12.83c	8.56de
T2	Tissue paper	9.08d	7.78e
T3	Clean sand	13.50abc	10.44bc
T4	Rice husk	13.42bc	9.78cd
T5	Rice husk ash	14.58a	12.56a
T6	Coconut fiber	14.05ab	11.56ab

Note: Any average with the same letter does not differ statistically at the level of 5% probabilities of DUNCAN'S (1955) method.

- Stem height: Table 2 showed that the stem height of the sprouts that grew on different growing mediums varying largely from 9.08 to 14.58 cm. The difference of stem height among treatments was significantly at the level of 5% of probabilities following Duncan's method. Among them, the stem height of sprouts grew on three treatments *i.e.,* rice husk ash, coconut fiber and clean sand obtained the highest stem heights, that in turn were 14.56, 14.05 and 13.50 cm. However, these stem heights were equivalent and not statistically significant. Sprout grew on tissue paper has lowest stem height of 9.08 cm.

- Sprout yield: The sprout yield have converted to kg of sprout on 1 kg of seed. The statistical analysis showed that the yield in different treatments have significantly different at the level of 5% of probabilities. The yield of sprout grew on two growing mediums *i.e.,* rice husk ash and coconut fiber gained highest yield. The yields on rice husk and coconut fiber medium in turn were 12.56 kg of sprout/kg of seed and 11.56 kg of sprout/kg of seed, respectively. However, the yields between them did not different significantly. The sprout grew on rice husk ash and coconut fiber yielded higher than other treatments significantly at the level of 5%. The sprout grew on fresh water and tissue paper were lowest with 8.56 and 7.78 kg of sprout/kg of seed, respectively.

2. Economic efficiency of sprouts grew on different treatments

The sprout expressed high nutrition value and favorable to many people. The sprouts were suitable for growing in many family households in the urban areas. Growing sprout need to be ensured the quality. In case of growing for selling, it needs to give high economic efficiency beside the quality. The finding of good growing medium – that is rice husk ash – in this study was also contributed to raise economic efficiency of sprout production in large scales.

The sprout has growing time very short; therefore, the capital turnover became very short. The capital invests for sprout production is not high but it gives equivalently high economic, social and environment efficiency. Growing sprout has also

give you condition to reduce stress. The green color of sprout creates the pleasant and relaxed sensation for growers. (www.rausach.com.vn, 2009).

For the comparison of economic efficiency in this experiment, the data indicated that 1kg of radish seed grew on the medium of rice husk ash after 5 days, harvesting from 12 – 13 kg of sprout. Whereas, growing on coconut fiber was harvesting 11 – 12 kg of sprout. Other treatments addressed lower sprout yields. The data for calculating economic efficiency were as follows:

+ The current price of sprout about VND 35,000 /kg.
+ Cost for 1 kg of radish seed VND 60,000 /kg
+ Cost for buying trays VND 20,000 /1 kg of seed
+ Cost for hiring labor VND 60,000 /workday
+ Other cost included scissors, baskets, plastics basins, containing tools…

Based on the yield gained from different treatments, we have calculated the economic efficiency for the sprout production on different growing mediums and presented in the Table 3:

The economic efficiency (for first batch of production about 5 days) was different in different treatments. Among them, the economic efficiency of the sprout produced on Rice husk ash gave highest economic efficiency with VND 288,600 and the lowest efficiency at tissue paper treatment with VND 85,300.

Two growing mediums addressed equivalent efficiency on rice hush ash and coconut fiber. For Coconut fiber medium, production cost was about VND 151,000 /kg, and it yielded 11.56 kg of sprout/1kg of seed. The net return was VND 242,600. 3

Meanwhile, for rice hush ash after 5 days, it yielded 12.56 kg of sprout/1kg of seed. The net return was VND 288,600. This return was the highest as compared to all treatments and higher than coconut fiber treatment.

It can remark that the succession batches will be reduced production cost due to reduce cost of investment for sprout production. The rice husk ash after sprout production can be used as fertilizer for other crops.

Table 3. The economic efficiency of sprouts growing on the different mediums (converting to 1 kg of seed)

Kinds of growing mediums	Cost of first batch sprout production (VND)					Total cost (VND)	Total income (VND)	Net return (VND)
	Growing medium	Tray	Paper, other tools…	Seed	Labor			
Rice hush ash	4,000	20,000	7,000	60,000	60,000	151,000	439,600	288,600
Coconut fiber	15,000	20,000	7,000	60,000	60,000	162,000	404,600	242,600
Fresh water	1,000	20,000	20,000	60,000	60,000	161,000	299,600	138,600
Tissue paper	40,000	20,000	7,000	60,000	60,000	187,000	272,300	85,300
Clean sand	15,000	20,000	7,000	60,000	60,000	162,000	365,400	203,400
Rice husk	4,000	20,000	7,000	60,000	60,000	151,000	342,300	191,300

CONCLUSIONS AND SUGGESTION

Conclusions

- The sprout grew on the two mediums as rice husk ash and coconut fiber yielded the highest over other treatments. These two yields were equivalent. The net return of growing sprout was obtained the highest on rice husk ash, due to reduce cost of buying medium.

- Rice husk ash is available and plentiful everywhere in the Mekong Delta. This growing medium can use for sprout production instead of coconut fiber or other growing mediums. Rice husk ash use for growing sprouts can ensure that the products are safe, clean and easy to use. It can buy with cheap price or free of charge in many milling factories in the Mekong Delta.

- From the results of study, it can conclude that, firstly, rice husk ash is the new growing medium for growing sprout with many good characteristics, and secondly, application of this sprout production procedure we can ensure the sprout products can gain VietGAP standard for clean and safety vegetable production.

Suggestions

- To continue the experiment in large scale at different periods.
- To be popularized the nutritional and health benefits of sprouts in the community and reduced the cost price
- To increase the knowledge and consumption of sprouts still small quantity currently.

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Nghiên cứu xây dựng quy trình trồng rau mầm sạch và hiệu quả cao

Ở các nước phát triển việc trồng rau mầm làm rau cung cấp dinh dưỡng, vitamin và các yếu tố cần thiết cho bồi dưỡng sức khỏe, phòng chống bệnh tật đã được chú trọng từ lâu. Rau mầm của họ đa dạng, giá trị cao và sản xuất rất hiện đại. Đối với nước ta, những năm gần đây do kinh tế ngày càng cải thiện, nhu cầu dinh dưỡng cần phải đảm bảo tính đa dạng và an toàn cho sức khỏe con người. Từ đó, rau mầm ngày càng được người tiêu dùng quan tâm và việc sản xuất ngày một nhiều và đa dạng. Rau mần thường được trồng trên các giá thể như đất sạch, mụn xơ dừa…Tuy nhiên, những giá thể này cũng không rẻ và sẵn có khắp nơi như tro trấu. Vì vậy, nghiên cứu này nhằm mục đích xây dựng quy trình trồng rau sạch đảm bảo theo tiêu chuẩn VietGAP và tìm nguồn giá thể mới -tro trấu- thay đổi những giá thể thông thường nhưng có hiệu quả kinh tế cao như đảm bảo năng suất, lợi nhuận cao hơn những giá thể khác. Kết quả nghiên cứu cho thấy rau mầm trồng trên giá thể tro trấu và mụn xơ dừa có năng suất cao nhất, khác biệt có ý nghĩa thống kê ở mức 5% so với các giá thể dùng trong thí nghiệm. Qua đó có thể kết luận tro trấu có thể dùng làm giá thể trồng rau mầm thay đổi với các giá thể như xơ dừa, đất sạch, cát, trấu… Nguồn tro trấu rất phổ biến ở vùng ĐBSCL, người sản xuất rau mầm có thể tự kiếm hoặc mua giá rẻ. Dùng tro trấu làm giá thể trồng rau mầm thay thế các loại giá thể khác và áp dụng theo quy trình trên đây có thể đảm bảo sạch, an toàn theo hướng ViệtGAP vừa tiện ích, rẻ tiền và dễ áp dụng.