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EFFECTS OF SUBSTRATES AND JEEVAMBRIT IN THE CULTIVATION OF STRAWBERRY

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Introduction

As a perennial herbaceous plant with soft fruits and short days, the strawberry (*Fragaria ananassa* Duch.), a member of the Rosaceae family, can be effectively grown at ideal day temperatures of 22°C to 25°C and night temperatures of 7°C to 13°C. A monoecious octoploid (2n=56) hybrid of two dioecious octoploid species, *Fragaria chiloensis Duch.* and *Fragaria virginiana Duch*., the commercial strawberry (Fragaria x ananassa Duch.) has a basic chromosomal number (x) of 7. Strawberry is a non-climacteric fruit that only ripens on plants. It is a soft-textured aggregate containing seeds that are visible on the outside of a red, fleshy container called an achene. It thrives primarily in temperate climates and is widely spread commercially using runners. Its fruits have a delicious and delightful flavor, 95 % water and 5% dry matter, and a considerable amount of vitamins and minerals, including protein (1.0 g/150 g), vitamin C (94 mg/150 g), and vitamin A (45 IU/150 g). Additionally, it has higher amounts of other substances such phenolics and flavonoids.

According to the National Horticulture Board, India covers an area of 3000 Hectares and a production of 20,000 Metric Tonnes for strawberry (2020-2021). Maharashtra occupied the largest area of 1.64000 Hectare and Chhattisgarh is the leading state in production of strawberry with 7.61000 Tonnes (1st Estimate report 2020-2021). Among other states and provinces, strawberry is grown commercially in India in the states of Haryana, and Delhi, Maharashtra, Punjab, as well as in sections of Himachal Pradesh, Jammu & Kashmir, Uttarakhand, and Uttar Pradesh, among other states and provinces

Substrates

Due to its extremely high yields per

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unit area, strawberry growing has recently gained popularity in India. Traditional soil-based strawberry production has a variety of issues, including soil-transmitted illnesses brought on by Verticillium spp. and Phytophthora spp, nematodes, and soil limiting factors, all of which reduce plant growth. A variety of soilless substrates and media can be used in place of soil to prevent the spread of pests and diseases that are transmitted through contaminated soil. Suitable substrate combinations in soilless cultivation within greenhouse systems improve strawberry harvesting times and maximize yield. Plant physiology and production are influenced both directly and indirectly by the characteristics substrate's material.

Characteristic of Substrates: Growing medium has certain qualities that make it ideal for cultivation, such as being lighter and more porous than soil, as well as having a special ability to hold water and nutrients at low tensions and improve root system aeration. The growth medium used not only increases the potential yield of strawberries but also enhances the fruit's quality by providing accurate control over the availability of water, nutrients, aeration, room temperature, and pH. This allows for precise control over the distribution of water, nutrients, pH, and root zonal temperature. The plants can absorb nutrients more effectively and grow and develop to the fullest extent possible to maximize their capacity to hold water and oxygen when a variety of organic and inorganic substrates are used. Based on their nature growing media are divided into two categories i.e Organic growing media and Inorganic growing media.

Table 1: List of different organic and inorganic growing media

Organic growing media	Inorganic growing media
Rice Husk	Perlite
Peat	Vermiculite
Sphagnum moss	Rockwool cube
Shredded bark	Calcine clay
Cocopeat	Expanded clay aggregate
Sawdust	Pumice

Source: *Anicua-Sánchez et al., 2005*

Cocopeat: The most widely utilized organic substrate in India is cocopeat, which has good water and nutrient retention qualities, aerial porosity, and cation exchange capacity.

Cocopeat + Perlite+ Vermiculite

Perlite: Perlite offers the media the necessary porosity and is rich in inorganic minerals like calcium, salt, and iron.

Vermiculite: It is very porous, easily absorbs water, and can hold 3–4 times its weight in water.

Vermicompost: Because vermicompost contains readily available forms of nutrients for plant uptake, such as nitrates, exchangeable phosphorus, potassium, calcium, and magnesium in addition to micronutrients, its application in soilless culture enhanced strawberry growth and yields dramatically. By precisely regulating the amount of water, nutrients, pH, and root temperature, the right amount of substrate in strawberries not only improves their potential production but also enhances their quality.

Coconut Husk: It increases the uptake of water and nutrients, improving growing conditions in the root zone, excellent cation exchange and water retention capacity. By mixing it with sand, coconut husk, which has high drainage and aeration, may hold more water. It is employed in sterile soilless growing methods.

Poultry Manure: In addition to ascorbic acid, poultry manure improved fruit production when combined with 50% NPK. Poultry manure enhances soil properties, including water infiltration, aeration, nutrient retention, and soil moisture holding capacity. Compared to other organic manure sources, it has a higher NPK content and other essential nutrients which provide plants the ability to absorb phosphorus more rapidly.

Farm yard manure/ FYM: It is a valuable source of organic matter and vital plant nutrients for small-holder farmers producing crops. It can also help farmers use less commercial fertilizer and increase profitability.

Rice husk: Rice husk is also easily available. It has been employed as an organic and inorganic substrate alternative in numerous investigations.

Sphagnum peat moss: The favourable physical qualities and strong nutrient exchange capability of Sphagnum peat moss make it a popular choice for soilless potting substrates in horticulture.

Effect of Substrates in strawberry culture

There were substantial differences in strawberry yields when different ratios of FYM, perlite, and cocopeat were employed as substrates. The best medium to use to increase strawberry yield, runner production, and growth is a combination of perlite and FYM (1:1). There have also been reports of different medium mixes improving aeration, which in turn improves root system formation and production. The highest values of leaf number, shoot length, and total leaf area with good quality and high strawberry production were achieved when coconut husk was used in black bags. Under polyhouse conditions, a

combination of perlite (75%) and cocopeat (25%) as well as jeevamrit@5% can be employed successfully to improve the yield of high-quality strawberries. For the soilless strawberry production method in a passively ventilated greenhouse, cocopeat in conjunction with vermiculite and cocopeat in combination with perlite and vermiculite is advised. This combination has a direct impact on the growth and quality of the strawberry.

The most effective way to increase strawberry growth and yield was to combine vermicompost and poultry manure with Azotobacter. The most suitable potting substrate for strawberry cultivation was found to be a combination of soil and vermi-compost and cocopeat, or soil and FYM and cocopeat in equal proportion (1:1:1). As a result, this combination was suggested as a suitable growing medium for the production of strawberries in terrace or rooftop gardening in peri-urban areas. When compared to soil, the 3:1:1 substrate combination of cocopeat, perlite, and vermicompost are significantly improved strawberry reproductive growth.

Jeevamrit

Conventional farm-based products like panchagavya, jeevamrit, and beejamrut are becoming more and more popular because they not only nourish the soil with native microorganisms but also have the potential to reduce crop disease incidence. The traditional Indian bioinsecticide and organic manure known as Jeevamrit is made by fermenting a mixture of cow urine and dung with jaggery, pulses flour, soil, and water. In addition to being cost-effective, it benefits the soil and plants. Using this amazing old remedy for plants can help farmers spend less on pesticides and fertilizers. Since Jeevamrit is entirely organic, it does not impact the soil in any way. This phrase comprises the two words "Jeevan" and "Amrit". Jeevan and Amrit are the two words. Jeevan signifies "life," whereas Amrit denotes "medicine." This particular chemical promotes in the supply of immunity inside the plant system and stimulates plant growth. Apart from helpful metabolites like hydrogen peroxide, organic acid, and antibiotics, microbes can also create antimicrobial toxins that are effective against a broad variety of pathogenic microorganisms. Additionally, bacteria can create compounds like organic acid and antibiotics that are beneficial to humans. Using Jeevamrit

increases the number of microorganisms and beneficial bacteria in soil. When sprayed to soil, jeevamrit will promote the expansion of earthworm populations. In addition to improving the soil's ability to retain water and be porous, earthworms also improve these properties. It has the capacity to absorb minerals from the deeper layers of the soil. Recommended dose of fertilizers was applied to the strawberry plants through fertigation using soluble fertilizers. Jeevamrit, which was manufactured in accordance with protocol, was sprayed typically at a dosage of 5% (5 L per 100 L of water) every 30 days. Throughout the experiments, all plants received the same cultural treatments.

Conclusion

The current research emphasizes the potential application of organic medium, such as cocopeat, perlite, and vermicompost, as a substrate for strawberry cultivation. Soilless media considerably affects strawberry plant performance. It can be concluded that, in polyhouse settings, a higher yield of high-quality strawberries can be achieved by utilizing a combination of 75% perlite, 25% cocopeat, and 5% jeevamrit.

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