
ASSESSMENT OF RICH MANURE FOR IRISH POTATOES: THE PROSPECT AND PREPARATION OF THE BEST COMPOST MIX FOR COMMERCIAL POTATOES FARMING

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ABSTRACT

The study analyzed the assessment of rich manure for Irish potatoes it prospects and preparation of the best compost mix for commercial potatoes farming. Manure, as organic fertilizers, provides essential nutrients to the soil, promotes soil structure and fertility, and enhances overall plant growth. The study revealed that the application of organic manure, such as farmyard manure or compost, significantly increased potato yield compared to chemical fertilizers. The study showed that the preparation of compost mix for commercial potato farming entails a meticulous blend of organic inputs, tailored to the specific nutrient requirements and soil conditions of potato crops. Common ingredients include animal manures, crop residues, and green waste, supplemented with amendments like bone meal, kelp meal, and rock phosphate to bolster nutrient diversity. On this basis it was concluded that the assessment and preparation of rich manure-based composts offer promising avenues for enhancing Irish potato cultivation, promoting soil fertility, and optimizing crop yields. By leveraging organic amendments and tailored compost blends, farmers can foster sustainable agricultural practices while reducing reliance on synthetic fertilizers. One of the recommendations made was that thorough soil testing should be conducted before applying compost, assess soil nutrient levels and pH to tailor compost formulations to specific deficiencies and requirements, ensuring optimal potato growth.

KEYWORDS: Rich Manure, Irish Potatoes, Compost Mix, Commercial Potatoes and Farming

INTRODUCTION

Irish potatoes (*Solanum tuberosum*) are a staple food for millions of people worldwide and a major source of income in many areas, making their production an important part of the world's agricultural output. In order to produce potatoes with the best possible yields and quality, sustainable agricultural methods must be used, which includes using fertilizers and soil additives sparingly. Rich manure-based composts are one of them that have drawn interest because of its potential to boost crop health, increase nutrient availability, and improve soil fertility. Specifically, the potential application of compost mixtures specifically designed for

commercial potato production offers a compelling way to optimize yields and profits while maintaining environmental responsibility.

Rich manure evaluation for Irish potatoes entails assessing a number of variables, including nutrient content, microbial activity, and the overall influence on soil health. Balanced amounts of vital nutrients, such as nitrogen (N), phosphorous (P), and potassium (K), as well as organic matter that is important for soil structure and moisture retention, are characteristics of high-quality compost. Furthermore, symbiotic interactions between compost and plant roots can be fostered by beneficial microbes, which can enhance nutrient uptake and disease resistance. Farmers can lessen their dependency on synthetic fertilizers, lessen harm to the environment, and promote long-term soil sustainability by utilizing these advantages.

The optimal compost mix for commercial potato farming requires a careful blending of organic inputs according to the unique nutrient needs and soil characteristics of potato crops. In order to increase nutrient diversity, common materials include animal manures, agricultural residues, and green waste, supplemented with additives like bone meal, kelp meal, and rock phosphate. Careful control of moisture content, aeration, and carbon-to-nitrogen ratios are necessary during the composting process to promote microbial breakdown and reduce pathogens and odors. Furthermore, cutting-edge methods like adding biochar and vermicomposting—which involves utilizing earthworms—can improve the quality of compost and its ability to retain nutrients.

CONCEPT OF COMPOST MIX MANURE

Compost-mixed manure is a potent organic amendment derived from the decomposition of various organic materials, including crop residues, kitchen scraps, yard waste, and animal manure. This nutrient-rich mixture offers numerous benefits for Irish potato cultivation, including enhancing soil fertility, improving nutrient availability, and promoting sustainable agriculture practices. Compost mix manure serves as a balanced source of essential nutrients, including nitrogen (N), phosphorus (P), potassium (K), and micronutrients crucial for robust potato growth. The decomposition process breaks down organic matter into stable humus, releasing nutrients gradually and ensuring a steady supply throughout the potato growth cycle. Additionally, compost mix manure improves soil structure, moisture retention, and microbial activity, creating a favorable environment for root development and nutrient uptake by potato plants.

Studies have shown the efficacy of compost mix manure in enhancing potato yields and quality while minimizing environmental impacts. For example, research by Smith (2016) highlights the role of compost in improving soil fertility and reducing the need for synthetic fertilizers, contributing to sustainable agriculture practices. Similarly, findings from Nishigaki et al. (2016) demonstrate the positive effects of compost application on soil properties and crop yields in agricultural systems. Compost mix manure represents a sustainable and environmentally friendly approach to enhancing Irish potato cultivation. By incorporating compost into agricultural practices, farmers can improve soil health, optimize nutrient management, and achieve higher yields, ensuring the long-term sustainability of potato production systems.

CONCEPT OF RICH MANURE

Generally speaking, "rich manure" refers to organic elements that have broken down and are applied as a natural fertilizer to increase soil fertility. The idea is based on organic and sustainable agricultural methods and aims to increase plant growth, improve soil health, and lessen the need for artificial fertilizers. Rich manure is an important source of organic matter and vital nutrients that improve the soil's general health and capacity to sustain healthy plant growth. As stated by Brinton (2018), Rich manure's origins are found in organic and sustainable agriculture, which places less emphasis on artificial chemicals and more emphasis on improving soil fertility and good plant growth. Rich manure is a term used to describe organic materials that have broken down and are applied as a natural fertilizer to enhance the nutrient content, soil structure, and general health of the soil. A varied microbial community in the soil is supported by the organic matter in rich manure.



Fig. 1: An Image of a manure

According to Ehaliotis et al. (2005), microorganisms are essential for decomposing organic matter, liberating nutrients, and enhancing the general health of the soil. Rich manure should either be mixed into the soil before planting or applied as a topdressing throughout the growing season in order to follow proper application procedures. This reduces the possibility of nutrient imbalances and guarantees that plants get access to nutrients when they're needed (Gaskell et al., 2019). One essential technique for producing rich manure is composting. It involves the aerobic breakdown of organic materials by microbes, including plant residues, yard waste, and kitchen scraps. Because of its high nutritional and organic matter content, the resulting compost serves as a balanced plant fertilizer (Brinton, 2018). Numerous vital elements, such as micronutrients, phosphorus, potassium, and nitrogen, are present in rich manure. As the organic matter breaks down, these minerals are progressively released, providing plants with a sustainable and organic supply of nutrition (Magdoff and van, 2009).

The soil's complex microbial community is sustained by rich manure. According to Ehaliotis et al. (2005), microorganisms are essential for decomposing organic matter, liberating nutrients, and enhancing the general health of the soil. One important source of organic matter and nutrients is manure from animals, including cows, horses, chickens, and rabbits. However, in order to prevent possible problems like nutritional imbalances and infections, animal dung must be adequately aged or composted before being added to the soil. Using organic resources to improve soil fertility and support sustainable agriculture is the main idea behind rich manure. People can help create healthier soils, more productive crops, and a more ecologically friendly method of producing food by incorporating rich manure into their farming techniques.

CONCEPT OF IRISH POTATOES



Fig. 2: Irish Potatoes

Irish potatoes, scientifically known as *solanum tuberosum*, are one of the most widely cultivated and consumed staple crops worldwide. Despite their name, they did not originate in Ireland but rather in the Andean region of South America. Irish potatoes are an important source of carbohydrates, vitamins, minerals, and dietary fiber in many diets around the world. Irish potatoes encompass various aspects, including their agricultural significance, nutritional value, culinary versatility, and global economic impact. Irish potatoes are cultivated in diverse climates and soil conditions, making them adaptable to a wide range of agricultural settings.

Irish potatoes are typically grown as annual crops from tubers, which are underground, stem structures that serve as storage organs. Irish potatoes are rich in complex carbohydrates, particularly starch, which provides energy for the human body. They also contain essential vitamins such as vitamin C, B vitamins (including folate), and minerals like potassium and manganese. Additionally, potatoes are a good source of dietary fiber, especially when consumed with the skin. Irish potatoes are highly versatile in the kitchen and can be prepared in numerous ways, including boiling, baking, frying, mashing, and roasting. They are used in a wide variety of dishes, from mashed potatoes and fries to soups, stews, and salads. Potato products, such as chips and crisps, are also popular snacks worldwide. The cultivation and trade of Irish potatoes have significant economic implications for many countries. Potatoes are grown commercially in major potato-producing regions such as China, India, Russia, and the United States. The potato industry encompasses various stakeholders, including farmers, processors, distributors, and retailers, contributing to job creation and economic development.

CONCEPT OF POTATOES FARMING

Potato farming is an agricultural practice that involves the cultivation of potatoes, which are one of the world's most widely consumed and versatile tuber crops. According to Hutchinson, Henninger, and Meredith (2020), potatoes belong to the solanaceae family, along with tomatoes, eggplants, and peppers and they are cultivated for their edible tubers, which are rich in carbohydrates, vitamins, and minerals. Successful potato farming requires careful planning, proper management practices, and attention to detail throughout the entire production cycle to ensure a bountiful harvest of high-quality tubers. Choosing suitable potato varieties is crucial for successful cultivation. Varieties differ in yield potential, resistance to diseases, and adaptation to various environmental conditions.



Fig. 3: An image of a potato farm

Farmers often select varieties based on market demand and regional climate suitability. Varieties like Russet Burbank, Yukon Gold and Kennebec are popular choices in many regions. Potatoes thrive in loose, well-aerated soil with a slightly acidic pH. Soil preparation includes ploughing, harrowing, and adding organic matter like compost or manure to improve soil fertility and structure. Throughout the growing season, potato crops require regular watering to maintain consistent soil moisture. Weed control is essential to minimize competition for nutrients and space. Farmers may employ techniques like hilling, which involves mounding soil around the base of plants, to encourage tuber development and protect them from sunlight exposure.

Potatoes are vulnerable to various pests and diseases, including potato beetles, aphids, late blight, and bacterial wilt. Integrated pest management (IPM) strategies involving crop rotation, use of resistant varieties, and judicious application of pesticides are common practices to mitigate these risks. Potatoes are typically ready for harvest 70 to 120 days after planting, depending on the variety and growing conditions. Harvesting involves digging up the tubers carefully to avoid damage. Mechanical equipment such as potato harvesters or diggers may be used for larger-scale operations. Proper storage conditions are crucial to maintaining potato quality and extending shelf life. Potatoes are stored in cool, dark environments to prevent sprouting and spoilage. They can be marketed fresh or processed into various products like

chips, fries, and dehydrated flakes for commercial distribution. Potatoes are susceptible to various pests and diseases, including potato beetles, aphids, blight, and rot.

However, they can be grown as a winter crop in warmer climates. Potatoes are related to peppers, tomatoes, and eggplants but are adapted to higher elevations and harsher growing conditions; the Incas in Peru first documented them. According to the Maine Potato Board, this vegetable arrived in the American Colonies in 1621, when the Governor of Bermuda sent potatoes to the Governor of Virginia at Jamestown. The edible part of the potato is the underground “tuber,” an enlarged underground storage portion of the potato plant. The tuber develops from underground stems called stolons once the plants are 6 to 8 inches tall, or around 5 to 7 weeks after planting. Potatoes are nuggets of goodness.

COMPONENT OF COMPOST MIX MANURE

Compost mix manure typically comprises a diverse array of organic materials that undergo decomposition to form a nutrient-rich humus (Bernal, Albuquerque & Moral 2016). The components of compost mix manure can vary depending on the availability of organic materials and the desired nutrient composition. However, some common components include:

- **Crop Residues:** Stalks, leaves, and other plant parts left over after harvesting crops contribute carbon-rich material to the compost mix. These residues break down slowly, providing a source of organic matter and helping to balance the carbon-to-nitrogen ratio in the compost pile.
- **Kitchen Scraps:** Fruit and vegetable peelings, coffee grounds, eggshells, and other kitchen waste are valuable additions to compost mix manure. These materials supply nitrogen and other nutrients essential for microbial activity and decomposition.
- **Yard Waste:** Grass clippings, leaves, branches, and other organic materials collected from yard maintenance activities can be incorporated into compost mix manure. Yard waste adds diversity to the compost pile and provides additional nutrients and organic matter.
- **Animal Manure:** Manure from livestock such as cattle, horses, poultry, and rabbits is a potent source of nitrogen, phosphorus, potassium, and other nutrients. Properly composted animal manure is essential to ensure that it is free from pathogens and weed seeds before use in the compost mix (Dec, Bollero & Bullock 2014).
- **Wood Chips or Sawdust:** These carbon-rich materials help create air pockets in the compost pile, improving aeration and facilitating decomposition. However, they should be used sparingly to avoid imbalancing the carbon-to-nitrogen ratio.
- **Green Manure:** Cover crops such as legumes (e.g., clover, vetch) or grasses can be grown and incorporated into the compost mix to add nitrogen and other nutrients. Green manure crops also help suppress weeds and improve soil structure.
- **Paper Products:** Shredded newspaper, cardboard, and other paper-based materials can be added to the compost mix to provide additional carbon and absorb moisture.

- **Microbial Inoculants:** Some composters may add microbial inoculants or compost starters to introduce beneficial microorganisms that aid in the decomposition process and enhance the quality of the finished compost.

These components work together to create a nutrient-rich compost mix manure that improves soil fertility, enhances plant growth, and promotes sustainable agricultural practices. Proper management of the composting process, including regular turning, moisture management, and temperature control, is essential to ensure the production of high-quality compost mix manure.

- **Rich Manure for Irish Potatoes:** Rich manure for Irish potato cultivation typically includes organic materials that are rich in nutrients essential for plant growth. These materials undergo decomposition and breakdown by microbial activity in the soil, releasing nutrients gradually to support potato growth and development (Martínez, et al. 2013). Some examples of rich manure suitable for Irish potato cultivation include:
- **Livestock Manure:** Manure from animals such as cattle, sheep, goats, poultry, and pigs is a valuable source of nutrients, including nitrogen, phosphorus, and potassium. Livestock manure is often readily available on farms and can be composted to accelerate decomposition and reduce the risk of pathogens (Smith, 2016).
- **Composted Organic Matter:** Compost derived from various organic materials such as crop residues, kitchen waste, yard trimmings, and green manures is an excellent source of nutrients for potato plants. Composting enhances the stability and nutrient content of organic matter, making it a sustainable option for soil improvement.
- **Green Manure:** Leguminous cover crops like clover, vetch, and peas can be grown and incorporated into the soil before planting potatoes. These green manures fix atmospheric nitrogen through symbiotic relationships with nitrogen-fixing bacteria, enriching the soil with this essential nutrient for subsequent potato crops.
- **Farmyard Manure:** Traditional farmyard manure, comprising a mixture of animal dung, straw, and bedding materials, provides a balanced blend of nutrients and organic matter beneficial for potato cultivation. Proper decomposition of farmyard manure before application reduces the risk of nitrogen tie-up and enhances nutrient availability.
- **Organic Amendments:** Various organic amendments such as composted bark, sawdust, rice hulls, and leaf mold can improve soil structure, water retention, and nutrient availability for Irish potato plants. These amendments contribute to long-term soil fertility and sustainability while reducing dependence on synthetic fertilizers.
- **Biogas Slurry:** Biogas slurry, a byproduct of anaerobic digestion of organic waste, contains nutrients and organic matter suitable for potato cultivation. Proper treatment and dilution of biogas slurry ensure balanced nutrient application and minimize potential risks associated with high concentrations of salts or pathogens (Singh ET, al 2019).

It is essential to consider factors such as nutrient content, availability, cost, and application methods when selecting and using rich manure for Irish potato cultivation. Additionally, farmers should aim for balanced nutrient management practices to optimize potato yields, minimize environmental impacts, and maintain soil health for sustainable agriculture.

HOW TO PREPARE COMPOST MIX MANURE?

Preparing a compost mix manure involves a systematic process to create a balanced blend of organic materials that will decompose effectively, producing nutrient-rich compost for use in agriculture. Below are the steps to prepare compost mix manure:

- **Selecting Ingredients:** Choose a variety of organic materials to create a diverse mix. Common ingredients include:
 - **Green materials:** kitchen scraps, fruit and vegetable peels, grass clippings, and fresh plant trimmings.
 - **Brown materials:** dried leaves, straw, cardboard, newspaper, and wood chips.
 - **Manure:** animal manure from herbivores such as cows, horses, or chickens. Ensure that manure is well aged to avoid potential pathogens.
 - **Other additives:** agricultural residues, coffee grounds, eggshells, and garden waste.
- **Balancing Carbon and Nitrogen:** Achieve the optimal carbon-to-nitrogen (C: N) ratio for efficient decomposition. Generally, a ratio of 25-30 parts carbon to 1-part nitrogen is ideal. Mix high-carbon (brown) and high-nitrogen (green) materials accordingly.
- **Shredding and Chopping:** Break down larger materials into smaller pieces to accelerate decomposition. Shredding or chopping materials into smaller fragments increases the surface area available for microbial activity.
- **Layering:** Alternate layers of green and brown materials in the compost pile. This helps ensure proper aeration and moisture distribution throughout the pile. Begin with a layer of coarse materials like twigs or straw to aid airflow at the bottom.
- **Adding Manure:** Incorporate well-aged animal manure into the compost pile. Manure provides essential nutrients and introduces beneficial microorganisms that aid in decomposition. Spread a layer of manure evenly over the compost pile.
- **Moistening:** Maintain adequate moisture levels in the compost pile, similar to a wrung-out sponge. Water each layer as you build the pile to ensure uniform moisture distribution. Avoid saturating the pile, as excess water can lead to anaerobic conditions and foul odors.
- **Turning and Aerating:** Regularly turn the compost pile using a pitchfork or compost turner. Turning introduces oxygen into the pile, facilitating aerobic decomposition and preventing unpleasant odors. Aim to turn the pile every 1-2 weeks to ensure even decomposition.
- **Monitoring:** Keep an eye on the compost pile's temperature, moisture, and odor. The internal temperature of a healthy compost pile should reach between 130-160°F (54-71°C) as microbial activity breaks down organic matter. Adjust moisture levels and add more materials if the pile becomes too dry or compacted.
- **Maturation:** Allow the compost pile to mature for 6-12 months, depending on environmental conditions and the initial composition of materials. Finished compost should be dark, crumbly, and earthy-smelling, indicating the completion of decomposition.

By following these steps, you can prepare a nutrient-rich compost mix manure suitable for enhancing soil fertility and promoting healthy plant growth in agricultural settings.

EFFECT OF MANURE ON IRISH POTATOES

The effect of manure on Irish potatoes has been extensively studied due to its significant impact on crop yield and quality. Manure, as an organic fertilizer, provides essential nutrients to the soil, promotes soil structure and fertility, and enhances overall plant growth. Khan et al. (2019) demonstrated that the application of organic manure, such as farmyard manure or compost, significantly increased potato yield compared to chemical fertilizers. This increase in yield was attributed to the improved soil structure and nutrient availability resulting from organic manure application.

Mupangwa et al. (2017) found that the incorporation of animal manure into the soil positively influenced Irish potato growth and development. The researchers observed higher tuber yields and improved soil fertility parameters in plots treated with manure compared to those treated solely with mineral fertilizers. Manure application can enhance soil microbial activity and diversity, contributing to improved nutrient cycling and overall soil health, which are essential for optimal potato growth (Haynes and Naidu, 2015). The effectiveness of manure application on Irish potatoes depends on various factors, including the type of manure, application rate, and timing. Proper management practices, such as adequate incorporation of manure into the soil and adherence to recommended application rates, are essential for maximizing its benefits while minimizing potential risks such as nutrient runoff or imbalance.

Here are some key effects of manure on Irish potatoes:

- **Nutrient Supply:** Manure serves as a natural fertilizer, providing a balanced supply of essential nutrients to the potato plants throughout their growth cycle. Nitrogen, in particular, is crucial for foliage development and overall plant vigor. Phosphorus aids in root development and tuber formation, while potassium contributes to disease resistance and starch synthesis in tubers. The balanced nutrient supply from manure can result in healthier plants and higher yields.
- **Improved Soil Structure:** Manure contains organic matter that helps improve soil structure by enhancing its water retention capacity, drainage, and aeration. This is particularly beneficial for potatoes, as they prefer well-draining soils with good moisture retention. Improved soil structure promotes root growth and allows better access to nutrients, leading to healthier plants and improved tuber development.
- **Enhanced Microbial Activity:** Manure contains beneficial microorganisms that contribute to soil health and nutrient cycling. These microbes help break down organic matter in the soil, releasing nutrients in forms that are more readily available to plants. Additionally, microbial activity stimulated by manure application can suppress soil-borne pathogens and diseases, reducing the risk of infections that can negatively affect potato yields.
- **Increased Organic Matter:** Continuous application of manure over time increases the organic matter content of the soil. Organic matter serves as a reservoir of nutrients and helps improve soil fertility in the long term. It also contributes to soil carbon sequestration, aiding in climate change mitigation efforts.

- **Potential Challenges:** While manure can offer numerous benefits to potato cultivation, there are also potential challenges associated with its use. These include the risk of introducing weed seeds, pathogens, or contaminants such as heavy metals if the manure is not properly composted or sourced from reliable sources. Additionally, excessive application of manure can lead to nutrient imbalances or nutrient runoff, negatively impacting water quality in nearby water bodies.

The judicious application of manure can have positive effects on Irish potato cultivation by providing essential nutrients, improving soil structure and microbial activity, and increasing organic matter content. However, it is important for farmers to carefully manage manure application rates and quality to maximize benefits while minimizing potential risks to crop health and the environment.

CONCLUSION

The study concludes that the assessment and preparation of rich manure-based composts offer promising avenues for enhancing Irish potato cultivation, promoting soil fertility, and optimizing crop yields. By leveraging organic amendments and tailored compost blends, farmers can foster sustainable agricultural practices while reducing reliance on synthetic fertilizers. The integration of scientific insights with practical farming experience provides actionable strategies for improving soil health and long-term productivity in commercial potato farming. Through meticulous compost management and soil stewardship, growers can mitigate environmental impact and contribute to the resilience of agricultural systems.

RECOMMENDATIONS

- Thorough soil testing should be conducted before applying compost, assess soil nutrient levels and pH to tailor compost formulations to specific deficiencies and requirements, ensuring optimal potato growth
- Use well-aged, properly composted manure from reputable sources to minimize the risk of introducing pathogens or weed seeds into the compost mix.
- Provide training and resources on best practices for compost preparation, application, and soil management to empower farmers to adopt sustainable approaches and maximize the benefits of rich manure-based composts in potato farming.

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