# Assessing the Effects of Different Application Rates of Mykovam on the Growth and Yield Performance of Tomato

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**DOI: https://doi.org/10.47772/IJRISS.2026.100400250**

**Received: 13 April 2026; Accepted: 18 April 2026; Published: 05 May 2026**

## ABSTRACT

Tomato (*Solanum lycopersicum*) is an important vegetable crop in the Philippines because of its nutritional value and wide range of uses. However, tomato production is often affected by poor soil fertility and low nutrient availability, which can reduce plant growth and yield. Biofertilizers such as Mykovam are considered a sustainable alternative to improve nutrient uptake and increase crop productivity. This study aimed to evaluate the effects of different application rates of Mykovam on the growth and yield performance of tomato. The experiment was conducted from January to April 2025 in Purok 3A, Monkayo, Davao de Oro, using a Randomized Complete Block Design (RCBD) with four treatments and three replications, with ten sample plants. The treatments were T1 – Control (no Mykovam), T2 – 5g Mykovam, T3 – 7g Mykovam, and T4 – 10g Mykovam. Differences among treatment means were compared using LSD, with statistical significance determined at $p < 0.05$. Growth parameters such as plant height, number of leaves, stem diameter, and days to flowering were recorded, while yield parameters included the number of fruits and yield per treatment. Results showed that the application of Mykovam improved several growth and yield parameters of tomato plants. The 7g Mykovam treatment produced better growth performance and the highest mean yield among the treatments. No phytotoxicity was observed in any treatment. Therefore, the application of 7 g Mykovam per plant is recommended to improve tomato growth and yield and support sustainable tomato production.

**Keywords:** Tomato (Solanum lycopersicum), Mykovam biofertilizer, application rate, plant growth, yield performance, sustainable agriculture.

## INTRODUCTION

Tomato, scientifically known as Solanum lycopersicum, is extensively cultivated throughout the world. It is considered to be one of the most profitable Crops in the Philippines and the second most important fruit or vegetable in the country after eggplant (Altoveros & Borromeo 2007). It was reported that 4.8 million Hectares of tomato were planted worldwide, with a production reaching 161.8 million tons in the year 2012 (FAOSTAT 2012). Moreover, the Philippines produced about 214.6 thousand metric tons of tomatoes from 16.7 thousand hectares (BAS 2015). Consumption of tomatoes by Filipinos continues to increase due to their wide Variety of uses and nutritional value. Tomatoes are rich in minerals, vitamins, Essential amino acids, sugars, antioxidants, and dietary fibers, which all contribute to a healthy and well-balanced diet.

Global and local production of tomato is threatened by various factors, which include the existing local weather, climate change, and the presence of pests and diseases. The presence of root-knot disease in tomato

ISSN No. 2454-6186 | DOI: 10.47772/IJRISS | Volume X Issue IV April 2026

and other vegetable crops has been established in the Philippines. Yield losses due to root-knot nematodes (RKNs) can reach over 30% for susceptible crops, which include tomato, eggplant, and melon. Root-knot is caused by plant-parasitic nematodes belonging to the genus Meloidogyne, and symptoms include the presence of galls in roots due to parasitism by these sedentary end parasites, which affects the absorption and transport of water and nutrients from the Soil. This leads to stunting, wilting, and general chlorosis. In the Philippines, yield losses of 20% to 85% caused by RKNs have been recorded, depending on the location where tomatoes are grown. Among the reported species of *Meloidogyne*, *M. Incognita* is the most Important in terms of the reported distribution and damage inflicted on the production of Various economically important crops, including tomato, in the Philippines.

The absorption and uptake of nutrients and water are the most important factors for successful tomato production in the Philippines. Tomatoes need a balanced supply of essential nutrients such as nitrogen, phosphorus, potassium, calcium, and magnesium to support healthy growth, flowering, and fruit development. However, nutrient availability in Philippine soils may be limited due to soil acidity, nutrient imbalances, or poor organic matter content. Water management is equally critical because tomatoes are sensitive to both drought and waterlogging. Irrigation systems that are poorly designed and erratic rainfall add to the problem of the availability of water for farmers. Poor soil conditions, improper fertilization, and improper watering schedules are the primary reasons for inefficient uptake of nutrients and water by the tomato plants. The most important thing in optimizing production is the practice of sustainable agriculture, including soil testing, proper application of fertilizers, and efficient irrigation techniques such as drip systems, ensuring tomatoes receive the right amount of nutrients and water throughout their growth cycle.

Mykovam is a soil-based bio-fertilizer containing spores. It infects roots and propagules. According to Dr. Jocelyn T. Zarate of UPLB BIOTECH, these fungi, when inoculated to seedlings, will infect the roots, help absorb water and nutrients, particularly phosphorus, prevent root infection by pathogens, and can increase plant tolerance to drought and heavy metals. The spores and propagules germinate around the roots of the host plant. The fungi eventually invade and stabilize within the roots and produce numerous extensive external hyphae. Mykovam bio-fertilizers can replace 60-85 % of the chemical fertilizer requirement of the plants and improve soil properties and fertility. It has been tested effectively for crops, fruit trees, and forest trees. Nely Aggangan, Head of UPLB – Biotech for Agriculture and Forestry Program, said Mykovam can also bring dead soil back to life, particularly acidic soil, a common condition on degraded soil in the Philippines

**Objectives of the Study**

This study aims to investigate the effects of different application rates of Mykovam on the growth and yield performance of tomato.

1. To evaluate the effects of different Mykovam application rates on tomato plant growth parameters, including the plant height, number of leaves, stem diameter, and number of flowers.
2. To assess the impact of Mykovam application rates on tomato yield components, including the number of fruits per plant, average fruit weight (g), and total fruit yield per treatment.
3. To determine the optimal Mykovam application rate for maximizing the yield of tomato.

## REVIEW OF RELATED LITERATURE

### Tomato Production

Tomato (Solanum lycopersicum) is the second most important horticultural product cultivated Worldwide (Villanueva, 2018). Its importance may be due to the nutritional benefits it provides. Every 100g of fresh tomato fruit provides 735mg of Vitamin A, 266mg of potassium, and 29mg of secondary metabolites such as lycopene, Flavonoids, phytosterols, and polyphenols (Luthria & Mukhopadhyay, 2006). Moreover, tomato is considered a model organism for research of the Solanaceae family and has therefore been and is still a major crop subject of studies both in the Laboratory and under field conditions (Villanueva, 2018).

Globally, tomato is an important food component and the second-largest vegetable in terms of production and consumption (Food and Agriculture Organization [FAO], 2016). Reports from the United States show tomato as the second most consumed fresh vegetable with 6 kg/person in 2016 (United States Department of Agriculture [USDA], 2016). The trend in the Philippines is the same, as tomato is also the second most important vegetable. In 2018, the production value of tomatoes in the Philippines was around Php3.9 billion, with a production volume of approximately 220.8 thousand metric tons (Statista, 2018). The demand for tomatoes is year-round, owing to their versatility in fresh and processed food preparation. However, the supply of tomatoes is limited, particularly during the off-season months, thus driving high prices in the market. This case shows the big need to increase the production of tomatoes in the country.

**Effect of Vesicular Arbuscular Mycorrhiza on Plant Nutrition**

Enhanced plant growth with VA mycorrhiza has been achieved in soil, peat, sand, and water culture. Gerdemann (1968) detailed the progressive enhancement of methods and addressed several technical challenges that stem from the necessity to eliminate native mycorrhizal fungi from most soils, as well as the difficulty in culturing Endogone species on synthetic media. In the past, soils were commonly "sterilized" via autoclaving or steaming, but today they are typically "sterilized" through gamma irradiation, fumigated with methyl bromide, chloropicrin, and methyl bromide handled with aerated steam, or steamed between electrodes. The impacts of inoculation in nonsterilized soil have also been investigated.

The majority of experiments have taken place in pots, although some have also been conducted in field plots. Spores from a Species of Endogone are now commonly utilized as inoculum. They are increased in conjunction with a host plant in "sterilized" soil or sand within greenhouse containers, which are frequently used alongside particles collected after wet sieving through sieves with specific mesh sizes. (Ross and Harper 1970) Cultivated their inoculum monoxenically in sealed jars, while Jackson, Franklin, and Miller 1972) utilized lyophilized. Soil, contaminated roots. Washed filtrates from the inoculum, which include numerous contaminating organisms, are typically incorporated into the controls (Clark 1969; Baylis 1971), and ground spores are incorporated. (Baylis 1959), (Gerdemann 1965) and (Holevas 1966) were the first to propose that the enhanced growth of plants inoculated with VA mycorrhiza could be attributed to greater phosphate absorption. Recent studies have examined the absorption of phosphate from deficient soils, varying sources and quantities of added phosphate, as well as from isotopically labeled soils and solutions in considerable detail.

**Nutrient Uptake and Accumulation**

To address different plant infections, agricultural methods such as bio-fertilizers, resistant varieties, plant quarantine, soil fumigation, and crop rotation are strategies that can enhance soil quality. Alternative approaches, including the incorporation of microorganisms such as AM fungi, should be employed to enhance plant disease resistance (Grosch et al. 2005). There is a growing interest in biological fertilizers that contain a wide variety of microorganisms. These kinds of fertilizers are eco-friendly, affordable, and commonly accessible across the nation. The significance of utilizing bio-fertilizers in farming lies in decreasing the use of mineral fertilizers, which results in reduced production expenses and enhances yield regarding both quality and quantity. Additionally, it enhances soil fertility, lowers the application rates of nitrogen and phosphate fertilizers by a minimum of 25%, and mitigates pollution issues (Sadhana 2014).

ISSN No. 2454-6186 | DOI: 10.47772/IJRISS | Volume X Issue IV April 2026

VAM fungi exist in 90% of plant species, functioning as part of a symbiotic relationship between the roots of higher plants and beneficial soil fungi (Zhu et al. 2010; Ahanger et al. 2014a, b). The AM fungi are connected to the roots of the host. In this relationship, the fungus and the plant share various molecules and components that contribute to the growth and reproduction of both partners (Ahanger et al. 2014a, b). The action of fungal hyphae and the organic compounds in the roots collects the fine soil granules, forming a complex structure that helps to retain them. AM fungi create numerous dense hyphae with the roots of the host plant, enabling the roots to cover a wide area of the soil and enhance plant growth. They also generate vesicles, arbuscular mycorrhizae, and hyphae within the root system (Bowles et al. 2016). AM fungi gather soil nutrients via their roots and subsequently transfer them through the mycorrhizae hyphae to the host plants (Simard et al. 2012). They release different substances that enhance the soil's structure, such as polysaccharide compounds, which assist in binding the soil particles together, boosting the soil's capacity to hold water.

In addition, they improve plant nutrition by refining various nutrients, soil quality, and plant health. (Thirkell and others 2017). The mutualistic connection of mycorrhiza grants the fungus consistent access to carbohydrates like sucrose and glucose (Harrison 2005). Carbohydrates are transported to the roots and then to the plant. AM fungi have a large surface area, helping plants absorb more water and minerals. Due to the more fragile and longer filaments of AMFs compared to plant roots, some AM fungi can hold onto soil minerals for the host's roots. The intake of minerals by plants is improved (Selosse et al. 2006). AM Fungi can create a competitive setting for this carbon alongside pathogens (Vos Et al. 2014). They have the capacity to improve nutrient absorption in hosts, primarily phosphorus absorption (Nell et al. 2010), and increase the activity of bacteria that dissolve phosphate.

The fungus utilizes different strategies to absorb Phosphorous, such as the release of the enzyme phosphatase by its hyphae, which degrades organic phosphorus and transforms it into forms that the plant can absorb. A different mechanism includes the emission of hydroxy acids. In settings where phosphorus is scarce, AM fungi invaded plants and significantly improved the transfer of phosphorus to the plant roots (Garcés-Ruiz et al. 2017a, b). When nutrients are confined to organic matter, AM fungi aid in the mobilization of these nutrients and deliver them to plants, signifying a distinct kind of fixation. (Hogan 2011). For example, in some dystrophic forests, AM fungi hyphae interacting directly with leaf litter absorb large amounts of phosphate and other nutrients, reducing the need for uptake from the soil (Hogan 2011).

Another study stated that plants and AM fungi have a relationship that is more intricate than mere mutualism. Research has indicated that AM fungi can obtain significant nitrogen from dead and decaying materials, allowing them to thrive and persist longer while generating substantial biomass (Hodge and Fitter 2010). The AM fungi are capable of transferring approximately 20–75% of the total nitrogen absorption to their hosts (Hashem et al. 2018a, b). In ambient and elevated $CO_2$ levels, inoculating with AM fungi boosts the accumulation of carbon and nitrogen as well as nitrogen uptake (Zhu et al. 2016). AM fungi help absorb nitrogen, phosphorus, and carbon, resulting in enhanced photosynthesis and better leaf development, while also promoting the growth of tuber size. Mycorrhizal association increases N, P, and Fe concentrations in sweetscented geraniums during periods of drought (Amiri et al. 2017a, b). It enhances the uptake of essential nutrients and reduces the uptake of Cl and Na, resulting in faster plant growth (Evelin et al. 2012). Many research projects on AM fungi have been carried out, each highlighting various advantages for soil vitality and agricultural output. Due to its ability to decrease the reliance on chemical fertilizers, especially phosphorus fertilizers, AM fungi are currently utilized as a substitute for inorganic fertilizers (Ortas 2012). Mykovam helps by increasing the root surface area, making nutrient uptake more efficient, and improving resistance to environmental stress, such as drought and soil-borne diseases. Additionally, it promotes healthier soil structure and microbial diversity, further supporting tomato plant growth.

**Mykovam**

Mykovam is a soil-based biofertilizer developed by the University of the Philippines Los Baños (UPLB) that contains effective species of fungi known as vesicular-arbuscular mycorrhiza (VAM). These fungi form a symbiotic relationship with plant roots, enhancing the plant's ability to absorb water and essential nutrients such as phosphorus, nitrogen, and zinc. This symbiosis not only improves soil properties and fertility but also increases the plant's tolerance to drought and heavy metals. In the case of tomatoes, applying Mykovam has been shown to promote better growth and yield. Studies indicate that tomato plants inoculated with Mykovam produce taller plants with larger leaf areas, thicker stems, and a higher number of fruits per plant compared to non-inoculated plants. Additionally, Mykovam can replace approximately 60-85% of the plant's chemical fertilizer requirements, making it a cost-effective and environmentally friendly alternative for tomato cultivation. As stated by (Anon 2018), Mykovam is a soil-derived biological fertilizer that consists of spores, infected roots, and propagules of advantageous vesicular-arbuscular mycorrhizal fungi. Mykovam aids the roots of seedlings in taking up water and nutrients, especially phosphorus. Mykovam additionally inhibits root infections caused by pathogens and enhances plant resistance to drought and heavy metals. Mykovam is affordable and simple to apply, as one kilogram can nourish 200 plants. The application occurs just a single time during the whole lifespan of a plant. It has the potential to substitute 60-85% of the chemical fertilizer needs of plants. Farmers are permitted to use Mykovam on crops like vegetables, root vegetables, fruit-bearing trees, and timber trees, excluding pines and dipterocarps.

Mykovam is a biofertilizer derived from soil that includes eight species of AMF. This biofertilizer is highly effective in enhancing the yield and survival of crops, forestry species, horticultural plants, forage plants, and fruit crops. Mykovam performs exceptionally in poor soil conditions (Abella 2012a). Abella (2012b) stated that this biofertilizer was advantageous for the fruit farmers in Panabo City, Davao Del Norte. In coconut, it was noted that an earlier harvest by a coconut farmer from Barangay Kipalili, San Isidro, Davao del Norte, Mindanao yielded three nuts per kilo (Abella 2013). Nonetheless, several months following the use of Mykovam, nuts weighed between 1.5 and 2.5 kg each. Root connections with AMF enhance plant growth and development, and they can serve as a biocontrol agent against soil pathogens like the Fusarium wilt organism infestation and nematodes in tomatoes (Aggangan et al. 2000a, 2000b). AMF may minimize the damage to plants caused by nematodes (Jaizme-Vega et al. 1997). In a durian plantation located in eastern Mindanao, Durian trees affected by Phytophthora (the most feared pathogen of durian) were managed through the use of Mykovam biofertilizer (Abella 2012c).

According to Sanchez, C. (2001). MykoVAM inoculated plants significantly produced taller plants with a bigger leaf area, bigger stem diameter, higher number of fruits per plant, higher yield, and longer and heavier roots. The best vegetative growth and higher yield were obtained from the plants inoculated with 7 grams of Myko VAM per plant. Myko VAM produced fewer grams and less growth and yield than the control. Beyond 7 grams of Myko VAM per plant, the growth and yield of tomatoes were adversely affected.

According to Elleva 2018), the application Rate of 5 grams of MYKOVAM® gave better root-shoot growth and a higher %RWC. Thus, early MYKOVAM® inoculation of the tissue-cultured Lakatan banana plantlets improved tolerance to water deficit by promoting better root growth and earlier recovery of shoot growth upon re-watering.

The study of Amba et al. (2022) showed that the performance of open-pollinated variety (OPV) young corn applied with Mykovam® bio-fertilizer has a significant effect on plant height, number of leaves, number of days to flowering, silking, number of corn cobs per plant, average length, and average weight of corn cobs. In terms of its yield, the Mykovam® serves as an organic bio-fertilizer. It is best to use Mykovam® bio-fertilizer since it is organically produced, which has no cause of pollution and no great effect on the environment, plants, consumers, and most especially on the soil itself. self.

# METHODOLOGY

### Location and Duration of the Study

The study field experiments were conducted in Purok 3A, Monkayo, Davao De Oro, from January to April 2025

### Soil Analysis

Soil samples were collected from the experimental site in Monkayo, Davao de Oro, with the square pattern and placed in a sack and air-dried for one week, and the soil was pulverized before the analysis for further examination at DA, Monkayo, Davao de Oro.

### Experimental Design and Treatments

The experimental design used in the study was a Randomized Complete Block Design (RCBD) with four (4) treatments, and replicated three (3) times, with 10 samples per replication. The total experimental area was 150 square meters, while each plot had an area of 10 square meters. The treatments used were T1-untreated, T2-5grams Mykovam, T3-7 grams Mykovam, and T4- 10 grams of Mykovam.

### Land Preparation and Planting

The field was plowed two to three times to help eliminate weeds, hibernating insect pests, and soil-borne diseases. The best time for plowing was when a ball did not form when the soil was squeezed by hand, and only a thin film of the soil stuck to the fingers and palm. The field was plowed at a depth of 15-20 cm. It was harrowed twice to break the clods and level the field. A Well-pulverized soil promoted good soil aeration and enhanced root formation. The diamante tomato variety was used as the experimental planting material with a spacing of 50 cm between plants and 100 cm between rows. The seeds were purchased from Agrivet Supply in Monkayo, Davao De Oro. Tomato seedlings from the PE bags were transplanted to the field in an open area with adequate sunlight. Planting holes about 30 cm deep were prepared, and Mykovam was placed in each hole before transplanting. The seedlings were carefully removed from the PE bags to avoid damaging the roots and were planted at a spacing of 50 cm between plants and 100 cm between rows.

### Mykovam application

Tomato plants were fertilized with Mykovam according to the specified treatments. In this study, Mykovam was applied using the basal application method, with a Mykovam application rate of ($T^1$- control) ($T^2$- 5g Mykovam) ($T^3$- 7g Mykovam) ($T^4$- 10g Mykovam) added per plant or per row at the time of planting.

### Cultural Management

Weeding was done twice a month to avoid competition and prevent the occurrence of pests and diseases. Hilling-up was done once, while Irrigation was carried out twice a week to maintain productivity. Trellises were established 20 days after transplanting, using locally available materials such as bamboo sticks. Pruning of unwanted branches was done once a month to reduce competition for nutrients.

ISSN No. 2454-6186 | DOI: 10.47772/IJRISS | Volume X Issue IV April 2026

**Data Gathered**

**Growth Parameters:**

***Plant height***

Plant height was measured from the base to the tip of the tomato plants using a meter stick in centimetres (cm). Measurements were taken weekly after transplanting until flower initiation.

***Number of leaves***

The tomato plant was determined by visually inspecting each plant and counting all fully developed leaves. Leaf counting was conducted weekly until flower initiation to ensure accurate measurement.

***Stem diameter***

To measure the plant diameter, the stem was laid horizontally on a flat surface and measured using a digital caliper. The caliper was positioned across the widest part of the stem. Stem diameter was measured weekly until flowering.

**Yield Parameters:**

***Number of Days to Flower***

This was recorded starting from the appearance of the earliest flowers, which were monitored daily through visual observation.

***Number of fruits per replication***

Counting of tomato fruit per replication was conducted by collecting all harvested fruit from each experimental unit and recording each individually to determine the total yield. Only fully matured fruit was considered to ensure accuracy. This process was repeated throughout the entire harvesting period.

***Yield (kg) per treatment***

The average yield per treatment was calculated by summing the total yield of all replicates within each treatment and dividing by the number of replicates. This provided the mean yield for each treatment, allowing for straightforward comparison of productivity among treatments.

**Statistical analysis**

Analysis of Variance (ANOVA) for the Randomized Complete Block Design (RCBD) was performed using the STAR software. Differences among treatment means were compared using LSD, with statistical significance determined at $p < 0.05$.

## RESULTS AND DISCUSSION

**Plant height**. The average of every treatment applied with different grams of mykovam; this data was gathered at seven (7) day intervals in plant height. Data increased steadily from Week 1 to Week 6 across all treatments,

ISSN No. 2454-6186 | DOI: 10.47772/IJRISS | Volume X Issue IV April 2026

indicating normal plant growth over time. However, variations were observed among the different Mykovam application rates. The control treatment (T1) and the 10 g Mykovam treatment (T4) produced moderate plant heights, reaching 9.93 cm and 10.03 cm, respectively, by Week 6. The 5 g Mykovam treatment (T2) recorded the lowest values throughout the observation period, while the 7 g Mykovam treatment (T3) consistently produced the tallest plants, increasing from 7.41 cm in Week 1 to 12.41 cm in Week 6. Although the p-value (>0.05) indicates that the differences among treatments were not statistically significant, the numerical trend suggests that the 7 g application rate promoted the most favorable vegetative growth among the treatments. The improved plant height observed in the 7 g Mykovam treatment may be attributed to enhanced nutrient and water uptake facilitated by mycorrhizal fungi, particularly improved phosphorus availability, which supports plant growth and development. Better vegetative growth, including increased plant height, is often associated with improved development of other growth parameters such as number of leaves, stem diameter, and flower production, which can eventually influence yield components like number of fruits and total fruit yield.

**Number of Leaves**. The average of every treatment applied with different doses of Mykovam. This data was gathered on (7) day intervals in the number of leaves. It was measured weekly under different application rates of Mykovam. The results show a gradual increase in the number of leaves from Week 1 to Week 6 across all treatments, indicating continuous vegetative development. Among the treatments, the 7 g Mykovam application (T3) consistently produced the highest number of leaves, increasing from 7.05 in Week 1 to 16.48 in Week 6. This was followed by the 10 g Mykovam treatment (T4), which also showed relatively high values, reaching 14.57 leaves by Week 6. The control treatment (T1) showed moderate leaf development, increasing from 5.27 to 12.33 leaves over the observation period, while the 5 g Mykovam treatment (T2) consistently recorded the lowest number of leaves, reaching only 8.12 by Week 6. The statistical analysis indicates that some observation weeks showed significant differences among treatments ($p < 0.05$), particularly during Weeks 2 and 4, suggesting that Mykovam application influenced leaf development during certain growth stages.

The greater number of leaves observed in the 7 g Mykovam treatment may be attributed to improved nutrient uptake and enhanced root activity resulting from effective mycorrhizal colonization. Mycorrhizal fungi are known to increase the availability of essential nutrients, especially phosphorus, which supports cell division, leaf formation, and overall vegetative growth. Plants with more leaves generally have greater photosynthetic capacity, allowing them to produce more energy for growth and reproductive development. Consequently, treatments that promote higher leaf production, particularly the 7 g Mykovam application, may contribute to stronger plant vigor and potentially improved flowering and fruit production. The significant differences in leaf number across treatments may be due to the beneficial effects of mycorrhizal fungi on nutrient uptake. According to Smith and Read (2008), arbuscular mycorrhizal fungi enhance phosphorus absorption, which promotes vegetative growth, including leaf production and general plant development.

**Stem Diameter.** The average of every treatment applied to different grams of Mykovam. This data was gathered on seven (7) day intervals in stem diameter and was measured weekly under different application rates of Mykovam. The results show a general increase in stem diameter from Week 1 to Week 6 across all treatments, indicating continuous plant development. Among the treatments, the 7 g Mykovam application (T3) consistently produced the thickest stems throughout the observation period, starting at 3.41 mm in Week 1 and reaching 5.99 mm by Week 6. This was followed by the 10 g Mykovam treatment (T4), which also showed relatively higher values compared to the control, increasing from 2.51 mm to 4.92 mm. The control treatment (T1) recorded moderate stem diameter values, while the 5 g Mykovam treatment (T2) showed the lowest measurements, ending at 2.85 mm in Week 6. The statistical analysis indicates significant differences among treatments in most weeks ($p < 0.05$), suggesting that the application of Mykovam had a notable influence on stem thickness during the growth period. The greater stem diameter observed in the 7 g Mykovam treatment may be associated with improved nutrient uptake and stronger root development facilitated by mycorrhizal fungi. Mycorrhizae enhance the plant's ability to absorb essential nutrients such as phosphorus and other

ISSN No. 2454-6186 | DOI: 10.47772/IJRISS | Volume X Issue IV April 2026

minerals, which contribute to better structural growth and stronger stems. Thicker stems are important for supporting plant height, leaf development, and the eventual weight of flowers and fruits. As a result, plants with larger stem diameters are generally more vigorous and capable of sustaining higher productivity. According to the statistical analysis, there were significant variations in stem diameter across treatments ($p < 0.05$), indicating that the administration of Mykovam had an impact on tomato plant stem development. When compared to other treatments, the 7 g Mykovam therapy consistently resulted in thicker stems. This could be explained by increased root activity linked to mycorrhizal 3429olonization and better nutrient uptake. The application of arbuscular mycorrhizal fungi greatly boosted stem diameter and other growth indices in tomato plants, according to Reyes-Pérez et al. (2020). Similar to this, Hasan et al. (2024) discovered that mycorrhizal inoculation greatly enhanced vegetative growth traits, such as stem diameter, demonstrating the critical function mycorrhiza plays in fostering plant vigour and structural development.

**Number of Days to Flower**. The average of every treatment applied with different doses of Mykovam was gathered over several days of flowering**.** The number of days to flowering of tomato plants under different application rates of Mykovam. The results indicate variations in the time required for the plants to produce flowers among the treatments. The control treatment (T1) and the 10 g Mykovam treatment (T4) both recorded the longest time to flowering at 48.00 days, indicating slower reproductive development. In contrast, the 5 g Mykovam treatment (T2) produced flowers earlier at 40.25 days, while the 7 g Mykovam treatment (T3) showed the earliest flowering at 36.75 days. The statistical analysis revealed a significant difference among treatments ($p = 0.0021$), suggesting that the application of Mykovam significantly influenced the flowering time of tomato plants. The earlier flowering observed in the 7 g Mykovam treatment may be attributed to improved nutrient uptake and enhanced physiological activity facilitated by mycorrhizal fungi. Mycorrhizal associations can increase the availability of essential nutrients, particularly phosphorus, which plays an important role in energy transfer, plant metabolism, and the transition from vegetative to reproductive growth. As a result, plants with better nutrient absorption tend to reach the flowering stage earlier than those without adequate microbial support. The results of Salvioli et al. (2012) and Wahb-Allah et al. (2014), who found that mycorrhizal inoculation can speed up blooming and enhance tomato plant growth, are consistent with the significant difference seen between treatments.

**Harvesting**. The average of every treatment applied to different grams of Mykovam. This data was gathered on harvesting. The harvesting performance of tomato plants across four harvest periods under different application rates of Mykovam. The results revealed variations in yield among treatments during the different harvests. During the first harvest, the 7 g Mykovam treatment (T3) recorded the highest yield with a mean of 2.65, followed by the 10 g Mykovam treatment (T4) with 2.38. The 5 g Mykovam treatment (T2) produced a moderate yield of 1.85, while the control treatment (T1) had the lowest value at 1.55. The statistical analysis for the first harvest indicated a significant difference among treatments ($p = 0.0189$), suggesting that Mykovam application influenced early fruit production. This result is supported by the findings of Smith and Read (2008), who reported that arbuscular mycorrhizal fungi enhance nutrient uptake and significantly improve plant productivity and yield in many crops, including tomato. Similarly, Bona et al. (2017) reported that tomato plants inoculated with arbuscular mycorrhizal fungi produced higher yields compared with non-inoculated plants due to improved nutrient absorption and plant growth. Moreover, Dasgan, Bol, and Gruda (2024) found that the application of arbuscular mycorrhizal fungi significantly increased tomato yield and improved fruit characteristics compared with untreated plants. In the second harvest, the 10 g Mykovam treatment showed the highest mean value, although the differences among treatments were not statistically significant. In the third and fourth harvests, the yield values gradually declined across treatments, with relatively small differences among them. Despite this, the higher yield observed during the first harvest in the 7 g Mykovam treatment suggests that an appropriate level of mycorrhizal inoculation can enhance early fruit production. The improved harvesting results may be associated with the positive effects of mycorrhizal fungi on nutrient uptake, plant vigor, and fruit development, which contribute to increased productivity in tomato plants.

**Yield per treatment**. The average of every treatment applied with different grams of Mykovam. This data was gathered on yield per treatment. The yield per treatment of tomato plants under different application rates of Mykovam. The results show variation in yield among the treatments, indicating differences in plant productivity. The 7 g Mykovam treatment (T3) recorded the highest mean yield of 3.65, followed by the 5 g Mykovam treatment (T2) with a mean yield of 3.42. The control treatment (T1) produced a moderate yield of 3.03, while the 10 g Mykovam treatment (T4) recorded the lowest yield at 1.77. These results suggest that the application of Mykovam at moderate levels may enhance tomato yield compared with the control treatment. However, the statistical analysis indicated that there was no significant difference among the treatments ($p = 0.1625$), suggesting that the variations observed in yield may not be statistically reliable. Despite this, the numerical results still show that the 7 g Mykovam treatment produced the highest yield among the treatments evaluated. The improved yield in this treatment may be associated with enhanced nutrient uptake and improved plant growth resulting from effective mycorrhizal colonization. Mycorrhizal fungi help increase the availability of essential nutrients and improve soil microbial activity, which can support better plant development and fruit production in tomato plants. Overall, the results indicate that the 7 g Mykovam application rate may provide a favorable balance for improving tomato yield performance. The results of Subramanian et al. (2006), who found that tomato plants inoculated with arbuscular mycorrhizal fungus produced significantly higher fruit output compared with non-inoculated plants, are consistent with the considerable difference seen in the first harvest. Garmendia, I., together with Manganiello, G. (2013). They discovered that, especially in the early phases of harvest, mycorrhizal inoculation greatly enhanced tomato growth, yield, and fruit output.

## SUMMARY

This study, titled "Assessing the Effects of Different Application Rates of Mykovam on the Growth and Yield Performance of Tomato (*Solanum lycopersicum*)" was conducted in Purok 3A, Monkayo, Davao de Oro, from January to April 2025 to determine how different application rates of Mykovam biofertilizer influence tomato growth and yield. The experiment used a Randomized Complete Block Design (RCBD) with four treatments: T1 – Control (no Mykovam), T2 – 5 g Mykovam, T3 – 7 g Mykovam, and T4 – 10 g Mykovam, each with three replications. Growth parameters such as plant height, number of leaves, stem diameter, and days to flowering were measured, along with yield parameters including number of fruits and yield per treatment. Results showed that the 7 g Mykovam treatment produced better plant growth, including taller plants, more leaves, thicker stems, and earlier flowering, and also recorded the highest mean yield among the treatments. Although some parameters were not statistically significant, the findings indicated that applying 7 g of Mykovam per plant can improve the growth and productivity of tomato and may contribute to more sustainable tomato production.

## CONCLUSION

The study evaluated the effects of different application rates of Mykovam on the growth and yield performance of tomato. Based on the results, the application of Mykovam influenced several growth parameters, including plant height, number of leaves, stem diameter, and number of days to flowering. Among the treatments, the application of 7 g Mykovam (T3) consistently showed better vegetative growth, producing taller plants, more leaves, thicker stems, and earlier flowering compared to the control and other application rates. These results indicate that the moderate application rate of Mykovam enhanced plant vigor and promoted better overall development of tomato plants.

In terms of yield performance, the 7g Mykovam treatment also demonstrated favorable results, particularly during the first harvest and in the overall yield per treatment. Although some parameters did not show statistically significant differences, the numerical trends consistently indicated that the 7 g Mykovam application supported better productivity compared with the other treatments. This improvement may be attributed to the beneficial effects of mycorrhizal inoculants in enhancing nutrient uptake, improving soil microbial activity, and promoting better plant growth and fruit development. Therefore, the results suggest that the application of 7 g Mykovam is the most effective rate among the treatments tested for improving both growth and yield performance of tomato.

## RECOMMENDATION

Based on the findings of the study, it is recommended that future research further investigate the use of Mykovam in tomato production using a wider range of application rates to determine the optimal level for maximum growth and yield. Experimenting with a larger sample size, more replications, and in different soil and environmental conditions may also help improve the reliability and applicability of the results. In addition, future studies may include other yield-related parameters such as fruit size, fruit quality, and total marketable yield to provide a more comprehensive evaluation of the effects of Mykovam on tomato production.

Furthermore, it is also recommended to investigate the interaction of Mykovam with other soil amendments, such as organic fertilizers or compost to determine whether combined applications could further enhance plant growth and yield. Monitoring soil nutrient status and root colonization by mycorrhizal fungi may also provide deeper insights into the mechanisms by which Mykovam improves plant performance. These improvements in experimental design and data collection would contribute to a more thorough understanding of the role of mycorrhizal inoculants in sustainable tomato production.

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