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ASSERTAINING THE USAGE OF PLANT GROWTH REGULATORS AMONG TOMATOE AND ORANGE GROWERS, A CASE STUDY OF KAKOLI SUB-COUNTY, BUDAKA DISTRICT UGANDA.

BY

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A Research Dissertation Submitted in Partial Fulfillment of the Requirement for the Award of the Degree of Bachelor of Science Education, in Biology Department Busitema University.

SUPERVOISOR; **Madam Flavia Natukunda.**

DECEMBER, 2023

DECLARATION:

I declare that to the best of my knowledge, this research study was conducted by me in the stated study area and the data collected was from respondents themselves. Not any part of this research article was duplicated from any earlier published research.

Signature: ..... Date 20/01/2024.....

MULOLO STEVEN

DEDICATION:

I dedicate this research study to Al mighty God for the life, wisdom and guidance given, my beloved mother Kadondi Alice for the care, financial, moral, and social support plus the continued encouragement throughout my academic journey. I also salute all friends more so those at campus for the help, encouragement, and support. With great honor, I thank my supervisor; Madam Flavia Natukunda for the great efforts she put in to guide, monitor, and encourage me throughout the research. It's my prayer that the Almighty God rewards her abundantly.

ENDORSEMENT:

As the supervisor of this research study, I do endorse it and also recommend the gaps in his research for further research by any other concerned scientists.

Supervisor's signature; ... Date 20/01/2024

Supervisor: Madam Flavia Natukunda

ABSTRACT

Plant growth regulators (phytohormones) are organic substances produced naturally in higher plants controlling growth or other physiological processes at a site distant from its production site except ethylene and are active in minute amounts. They include auxins, gibberellins, cytokinins, ethylene, abscisic acid (ABA), growth regulators and retardants. Phytohormones are vital agents in integration of developmental activities. They influence various plant processes for example, Auxins promote lateral and adventitious root formation, control fruit drop and fruit quality, gibberellins stimulate stem elongation, determine sex, control fruit growth, seed development and germination. The low and poor quality and quantity of fruit yields has called for substantial use of PGRs whose use in the right amounts, at right stages during plant growth can improve fruit produce together with optimum provision of other factors affecting plant growth and yield. Great research had been conducted on the usage and effects of plant growth regulators on large scale fruit plant production; however small-scale farmers had often been left out. Therefore, this study investigated the usage of PGRs among tomato and orange growers. Observations, interviews and schedules were used to gather information about the study. Text analysis was significantly used to analyze, treat and interpret the obtained data so as to create meaning of it. This study obtained relevant data about the usage of PGRs used by small-scale fruit growers in the study area.

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LIST OF ABBREVIATIONS;

EP means ethephon

ET means ethylene

F means farmer

GA means gibberellic acid

IAA means indole acetic acid

PGRs means plant growth regulators

TABLES AND CHARTS.

CHAPTER ONE: INTRODUCTION.

1.1Background

1.1.1 Conceptual Perspective

Plant Growth Regulators (PGRs)or plant hormones are organic molecules except nutrients which control plant physiological functions whether (not) they are naturally occurring and/or synthetic; stimulating and/or inhibitory; local activators or compounds that function at places away their production sites except ethylene. they are active in minute amounts and used in agriculture to enhance plant growth, development, and yield(Bisht, Rawat, Chakraborty, & Yadav, 2018).

Thiemann (1963) termed plant hormones as “phytohormones” (as they are synthesized in plants) to differentiate them from animal hormones. He defined a phytohormone as an organic substance produced naturally in higher plants, regulating growth or other physiological processes at areas away from their production sites and active in small quantities(Le Roux, 2018).

There are five major classes of PGRs: auxins, gibberellins, cytokinins, abscisic acid, and ethylene. Each class of PGRs has a unique mode of action and affects different aspects of plant growth and development. Auxins promote cell elongation and differentiation, while gibberellins stimulate stem elongation and seed germination. Cytokinins promote cell division and delay senescence, while abscisic acid regulates seed dormancy and stress responses. Ethylene promotes fruit ripening and leaf abscission (Basra, 2000).

1.1.2 Contextual Perspective

Globally, PGRs are used significantly, with a market size estimated to reach $2.93 billion by 2026. The increasing demand for food due to the growing population and the need for higher crop yields have led to the widespread use of plant growth regulators in agriculture

In Africa, the use of PGRs is still limited compared to other regions of the world due to limited awareness and knowledge about PGRs and their effective use and cultural or traditional practices that discourage the use of synthetic chemicals in agriculture. However, in Egypt, gibberellic acid is used to increase the size and quality of grapes. In Ethiopia, naphthalene acetic acid is used to improve the rooting ability of coffee cuttings. In Kenya, paclobutrazol is used to control vegetative growth in mango trees(Rademacher, 2016).

PGRs are widely used in Uganda to enhance plant growth, development, and yield in various crops like maize, rice, coffee, bananas, and vegetables. Commonly used PGRs in Uganda include auxins, cytokinins, gibberellins, abscisic acid, and ethylene. They have different effects on plant growth and development depending on their concentration, timing of application, and the crop species. These include; promotion of flowering and branching, increase flower bud formation, inhibit flower bud formation, thinning by promotion of fruit/flower abscission, retard pre-harvest drop, improve fruit finish, improve fruit shape, Vegetative growth control, increase fruit set, increase fruit red color, Advance fruit ripening, Delay fruit ripening, enhance rooting, suppress growth of water sprouts, Improve stress tolerance (Raven, Evert, & Eichhorn, 2005).

1.1.3 Historical Perspective

The history of PGRs dates back to the early 1900s when scientists discovered that certain chemicals could mimic or inhibit the effects of plant hormones. Since then, numerous studies have been conducted to understand the mechanisms of PGRs and their applications in agriculture, horticulture, and forestry.

One of the earliest discoveries in the field of PGRs was made by Charles Darwin and his son Francis in 1881. They found that a gas called ethylene could stimulate the ripening of fruits. Later, in 1926, Frits Warmolt Went discovered a substance called auxin that promoted cell elongation in plants. In the following years, other plant hormones such as gibberellins and cytokinins were identified(Taioz, Zeiger, Moller, & Murphy, 2015).

The use of PGRs in agriculture began in the 1950s with the introduction of synthetic auxins such as 2,4-D and MCPA for weed control. In the 1960s, gibberellins were used to increase the yield of crops such as rice and wheat. Since then, numerous PGRs have been developed for various applications such as promoting root growth, delaying senescence, and improving fruit quality. Today, PGRs are widely used in modern agriculture to improve crop productivity and quality. However, their use is regulated by government agencies to ensure their safety for human consumption and environmental impact(Raven et al., 2005).

1.1.4 Theoretical Perspective.

This study shall the based on several theories among which are the following;

Cholodny-Went Theory: This theory was proposed independently by Russian scientist N. Cholodny and Dutch scientist Frits Warmolt Went in the 1920s. The Cholodny-Went theory

primarily deals with the role of auxins, a class of PGRs, in phototropism (growth towards light) and gravitropism (growth in response to gravity). According to this theory, auxins are synthesized at the shoot apex and move towards the base of the plant. In phototropism, auxins accumulate on the shaded side of the stem, promoting cell elongation on that side and causing the stem to bend towards the light source. In gravitropism, auxins accumulate on the lower side of the stem or root, resulting in differential growth and bending in response to gravity.

Acid Growth Theory: Proposed by Pilet et al. in 1969, this theory postulates that auxins promote cell elongation by inducing an increase in cell wall extensibility through acidification of cell wall components. According to this theory, auxins activate proton pumps in the plasma membrane, leading to an influx of protons into the cell wall space. This lowers the pH and activates enzymes called expansins, which break hydrogen bonds between cellulose microfibrils and hemicellulose cross-links, allowing cell wall loosening and cell expansion.

Receptor Theory: This theory focuses on the role of specific receptors in mediating the effects of PGRs. According to this theory, PGRs bind to specific receptor proteins, initiating a cascade of signaling events that ultimately lead to changes in gene expression and cellular processes. For example, auxin binds to its receptor TIR1 (Transport Inhibitor Response 1), which is part of an SCF (Skp-Cullin-F-box) ubiquitin ligase complex. This binding triggers the degradation of Aux/IAA repressor proteins, allowing the transcription factor ARF (Auxin Response Factor) to activate auxin-responsive genes.

Gene Regulation Theory: This theory emphasizes the role of PGRs in regulating gene expression and, consequently, various physiological processes. For instance, gibberellins (another class of PGRs) are known to regulate the expression of genes involved in cell elongation and division by promoting the degradation of DELLA proteins, which are negative regulators of growth.

Signal Transduction Theory: This theory posits that PGRs function by modulating signal transduction pathways within the cell. For example, cytokinins (a class of PGRs) bind to histidine kinase receptors, triggering a phosphorylation cascade that ultimately leads to changes in gene expression and cellular responses(Raven et al., 2005).

1.2 Statement of the Problem

Tomatoes and oranges are a potential source of food, income, foreign exchange and employment to humanity. According to the Food and Agriculture Organization (FAO), the fruit industry employs over 2 million people in Uganda. However, the rapidly increasing population in Uganda and the study area in particular caused heightened demand for employment opportunities. Additionally, the changing weather conditions, monoculture, reduction in soil fertility, unawareness and insufficient use of PGRs. This had caused famine, unemployment, and poor living standards. This study investigated the extent of usage of PGRs so as enhance PGRs usage and improve tomato and orange yields.

1.3Purpose of the Study

The main intent of this research was to ascertain the extent to which framers are using PGRs**.**

1.4 Objectives of the study

- To ascertain the extent of usage of plant growth regulators among tomato and orange farmers
- To determine the PGRs used by farmers in the study area

1.5. Research Questions

- What plant growth regulators do the farmers use?
- To what extent do farmers use plant growth regulators?

1.6. Research Hypotheses

1.6.1. Null Hypothesis

- The farmers do not use plant growth regulators
- The farmers use PGRs to a less extent

1.6.2. Alternative Hypothesis

- The farmers use plant growth regulators
- The farmers use PGRs to a great extent

1.7 Significance of the Study

The global population has grown significantly over the past centuries, with the most rapid growth occurring during the 20th century. As of 2021, the world's population is estimated to be

around 7.8 billion people. This has called for increased demand of basic needs most significantly food required for the survival and continued existence of the human species; this has resulted into improvements and innovations in the agricultural sector among which include the use of PGRs.

This study sought information on the usage of PGRs among tomato and orange growers in the study area. This information shall help to boost the usage of PGRs as this can boost tomato and orange yields and associated benefits to study area and neighboring communities.

1.8 Conceptual Framework of the Study

The conceptual framework of this study involved understanding the mechanisms via which hormones interact with plant cells and tissues, and also their effects on plant growth and development. This entails categorization of plant hormones into different classes basing on their chemical structure and physiological effects. The five main classes of plant hormones are; auxins, gibberellins, cytokinins, abscisic acid and ethylene each of which has a distinct role in regulating different aspects of plant growth like cell division, elongation, differentiation, and maturation (Sanchez et al, 2014).

Additionally, it examined how plant hormones interact with one another and other environmental factors to control plant growth and development. For instance, the equilibrium between auxins and cytokinins can influence the formation of roots or shoots in a developing plant, while stress factors like drought and flooding can cause ethylene production.

In order to comprehend the intricate connections between plants and their environment, the study of plant growth regulators is an interdisciplinary field that draws on information from biochemistry, physiology, genetics, and ecology (Kieber et al., 2018).

1.9 Scope of the study

This study was conducted in Kakoli sub-county in Budaka district and involved small scale farmers as they experienced losses and low crop yields due to unawareness and limited knowledge on the usage of plant growth regulators. Large scale farmers were excluded from the study as they are very few in the study area that is, could not give an appropriate sample. The study took around two months as I anticipated this was enough to collect and analyze data.

CHAPTER TWO: LITERATURE REVIEW

2.1. Conceptual review

PGRs are small signaling molecules that profoundly modulate the growth and development of crop plants, affecting cell division and enlargement, growth traits, metabolic processes, vascular patterning, flowering, and fruit and seed development. PGRs are well recognized for enhancing photo assimilates partitioning, nutrient acquisition, stress tolerance, membrane permeability, and stability(Shah et al., 2023).

Plant growth regulators (PGRs) are organic compounds that influence various aspects of plant growth and development. They can be classified into two categories: plant hormones and synthetic growth regulators. Plant hormones are naturally occurring substances produced within the plant, while synthetic growth regulators are man-made chemicals that mimic the action of plant hormones (Taioz et al., 2015).

Plant growth regulators are naturally biosynthesized chemicals in plants that influence physiological processes. Their synthetic analogous trigger numerous biochemical and physiological processes involved in the growth and development of plants (Ayman et al. 2021).

Therefore, Plant Growth Regulators (PGRs)or plant hormones are organic molecules except nutrients which control plant physiological functions whether (not) they are naturally occurring and/or synthetic; stimulating and/or inhibitory; local activators or compounds that function at places away their production sites except ethylene. They are active in minute amounts and used in agriculture to enhance plant growth, development, and yield.

2.2. Theoretical Review.

PGRs improve the quality and quantity of their crops. A study using the acid growth theory revealed that farmers who used PGRs had higher yields compared to those who did not use them(Zahid, Iftikhar, Shimira, Ahmad, & Kaçar, 2023).

PGRs are also used in tomato and orange production applying the **Signal Transduction Theory** and they are said to improve the growth and yield of tomatoes and oranges (Zahid et al., 2023).

However, there is limited information on the extent of usage of PGRs in Uganda. Research about the knowledge, attitudes, among farmers in Uganda regarding the use of PGRs using the **Receptor Theory** and found that 75% of the farmers used PGRs on their crops, with the majority

using them to enhance growth and yield. However, only a small percentage of farmers had received training on the proper use of PGRs (Baguma et al., 2023).

My study shall hence use these and other theories to reach to the study objectives.

2.3. The Recommended Usage of PGRs

Each PGR is recommended to be used at least three times during the growing period of the plant in question that is; during planting, flowering and fruiting. This is claimed to be enough to regulate and monitor the sufficient growth of tomatoes and oranges and also ensure maximum yields.

It's also recommended that several PGRs be used together as they cumulative effects on regulating tomato and orange growth is far beyond what one PGR can cause. This can be seen from the cumulative effects of auxins and gibberellins on seed germination.

It's usually advisable to apply the PGRs in holes during planting and he applied during growing, it should be sprayed in water over the plants as this is claimed to ease dissolution and transportation of the substances to sites of action. Spraying is also recommended early in the morning as this ensures the PGRs dry up on the plant tissues before it could probably rain in the afternoon or evening.

2.4. The Farmers Perspectives

Most farmers in the study area think applying PGRs for at most twice during the growing period is enough to boost yields in tomatoes and oranges. In fact, most farmers prefer applying once as they claim they do not have sufficient resources to apply PGRs many times.

Other farmers think it's not necessary to apply PGRs as they claim the soil is fertile enough and has all the nutrients it requires to support the growth of plants on its own. However, it's worth noting that these farmers were ignorant about the presence and the good benefits of using PGRs in tomato and orange growing.

Some farmers had fear using PGRs as they assume the substances are prohibited by government and that anyone found using them can even be imprisoned and this could limit and prevent such farmers from using PGRs in growing tomato and oranges.

Some farmers claim use of local mulches and organic manures is far beyond application of PGRs and this would be a waste of their little money. In fact, most of such farmers use banana leaves, and garden residues to mulch their tomato and orange plantations thinking that they are enough to support the growth and proper yielding of their crops.

2.5. Gaps in Literature

Several publications have been made about plant growth regulators in regard to awareness, usage, their various effects on plant growth and development and the potential risks and drawbacks of continuous use of plant growth regulators however little if any literature has been published about the extent of usage of plant growth regulators among farmers in the study area which shall therefore be addressed in this study.

CHAPTER THREE: METHODOLOGY

3.1. Study Site

This study was conducted in Kakoli sub-county which lies in eastern part of Budaka district in eastern Uganda. The study site comprises of four parishes each having four villages. The major economic activity carried out in this area is farming from which the natives obtain food and money to pay school fees and access other basic needs. Most the farmers operate on small scale and grow crops like maize, beans, soya beans, ground nuts, millet, sorghum, and cassava which are the staple food in the area. The farmers also grow fruit crops like tomatoes, oranges, mangoes, and others to a certain extent; this supplements food supply and also provides income after selling the fruits and their products.

3.2. Research Design

The study was carried out using the qualitative research design and in particular using the case study method; this entailed face to face and unstructured interviews, and use of schedules. Observations were also employed to aid read the body language of the respondents so as to compare them to their responses.

3.3. Sampling Design

The target population of this study was the small-scale farmers in the study area and the sampling frame included all such farmers who were present and accessible during the study period and the samples were obtained from this using simple random sampling where I took on any farmer found within the study area and period without bias. My sample included about 30 farmers: that was 7 or 8 in each parish and 3 0r 4 farmers each village.

3.4. Data Collection

Unstructured interviews, unstructured observation, and schedules were used to collect data from the respondents. The data collection tools among others included pens, pencils, and papers. Schedules were used to aid collect data from farmers who are unable to write as their responses were accurately and appropriately recorded by myself without any bias.

3.5. Data analysis

The thereby obtained data shall be analyzed using text analysis, and presented in form of tables and charts. The tables and charts shall illustrate the PGRs used, their application frequency, application, and the stages during crop planting at which they are applied.

4.0. CHAPTER FOUR: RESULTS (DATA)

4.1. INTRODUCTION

The main intent of this research was to ascertain the extent to which framers are using PGRs**.** This entailed getting information from the farmers about the PGRs they use, the frequency (no of times) of application, the crops grown, and the stage of crop planting during which the PGRs are applied.

The objectives of this research study included the following;

- To ascertain the extent of usage of plant growth regulators among tomato and orange farmers
- To determine the PGRs used by farmers in the study area.

The study majorly answered two research questions and these were;

- What plant growth regulators do the farmers use?
- To what extent do farmers use plant growth regulators?

4.2. DATA COLLECTION AND ANALYSIS

The information and data was collected from respondents using tools like pens, pencils to fill schedules and unstructured interviews as these helped to obtain enough data from them without their fear as they could not see me write anything as we were conversing.

The obtained data was analysed using text analysis and it was presented in simple tables and charts.

4.3. RESULTS (DATA)

The collected data is presented in the table below;

Table 1: some PGRs used

Where F means farmer

Farmer	**PGR used**	**Frequency of usage**	**Plant**	**Application time**
F1	**Indole acetic acid**	**1**	**Oranges**	**Planting**

F2	**Ethephon**	**3**	**Tomatoes**	**Fruiting**
F3	**Ethylene**	**2**	**Oranges**	**Fruiting**
F4	**Indole acetic acid**	**2**	**Tomatoes**	**Fruiting**
F5	**Gibberellic acid**	**1**	**Oranges**	**Planting**
F6	**Ethephon**	**3**	**Oranges**	**Fruiting**
F7	**Ethephon**	**2**	**Oranges**	**Fruiting**
F8	**Gibberellic acid**	**2**	**Oranges**	**Planting**
F9	**Ethephon**	**2**	**Tomatoes**	**Harvesting**
F10	**Ethylene**	**1**	**Tomatoes**	**Fruiting**
F11	**Gibberellic acid**	**3**	**Tomatoes**	**Planting**
F12	**Indole acetic acid**	**2**	**Oranges**	**Fruiting**
F13	**Gibberellic acid**	**2**	**Oranges**	**Planting**
F14	**Ethylene**	**2**	**tomatoes**	**Fruiting**
F15	**Gibberellic acid**	**1**	**Tomatoes**	**Planting**
F16	**Ethephon**	**3**	**Tomatoes**	**Fruiting**
F17	**Ethephon**	**2**	**Oranges**	**Fruiting**
F18	**Ethylene**	**2**	**Tomatoes**	**Flowering**
F19	**Ethephon**	**1**	**Tomatoes**	**Fruiting**
F20	**Indole acetic acid**	**1**	**Oranges**	**Planting**
F21	**Gibberellic acid**	**2**	**Oranges**	**Planting**
F22	**Gibberellic acid**	**2**	**Tomatoes**	**Planting**
F23	**Ethephon**	**2**	**Oranges**	**Fruiting**
F24	**Ethylene**	**1**	**Tomatoes**	**Fruiting**
F25	**Ethephon**	**1**	**Oranges**	**Harvesting**
F26	**Ethylene**	**2**	**Oranges**	**Harvesting**
F27	**Gibberellic acid**	**1**	**Tomatoes**	**Planting**
F28	**Indole acetic**	**2**	**oranges**	**Planting**

	acid			
F29	**Gibberellic acid**	**2**	**Oranges**	**Planting**
F30	**Ethephon**	**2**	**Tomatoes**	**Harvesting**

Source: primary data

Table 1summarizes PGRs usage

5.0. CHAPTER FIVE: DATA ANALYSIS

5.1. STUDY PURPOSE

The main purpose of this study was to ascertain the extent of usage of plant growth regulators in terms of the PGRs used, their frequency of usage, the crops grown, and the application times during crop growing.

5.2. STEPS IN DATA COLLECTION

The data was collected by visiting farmers all over the study site and interviewing them from which the obtained data was filled in schedules. Unstructured interviews also helped the thorough collection of data.

Several farmers were interviewed on the plant growth regulators they were using, the number of times of application, the application times during plant growth and the crops grown.

5.3. TYPE OF DATA

The collected data was primary qualitative involving noting down responses from the respondents, however this data was later turned into numerical information by comparing the application frequencies, application times, and the degree of usage of the different plant growth regulators.

5.4. ASSUMPTIONS MADE

The following assumptions were made during this research investigation;

- The farmers have little information about the availability band usefulness of plant growth regulators.
- Those who are informed hardly access and use plant growth regulators
- Most farmers have a negative attitude towards plant growth regulators

5.5. DATA PRESENTATION

The obtained data from this investigation shall be presented in form of charts as seen below;

Chart 1: showing the extent (percentage) of usage of PGRs

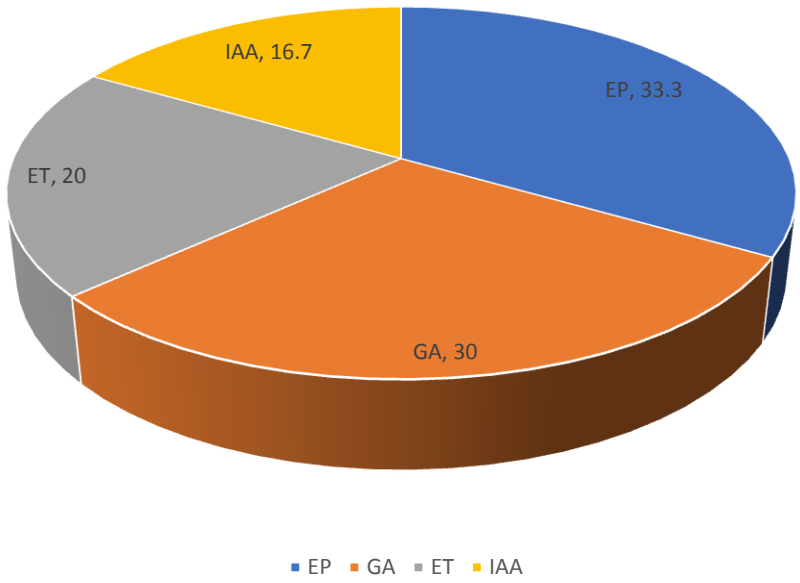

Table 2 shows a chart of extent of usage of PGRs

Where; EP means ethephon

GA means gibberellic acid

ET means ethylene, and

IAA means indole acetic acid

Chart 2: showing the application times for PGRs

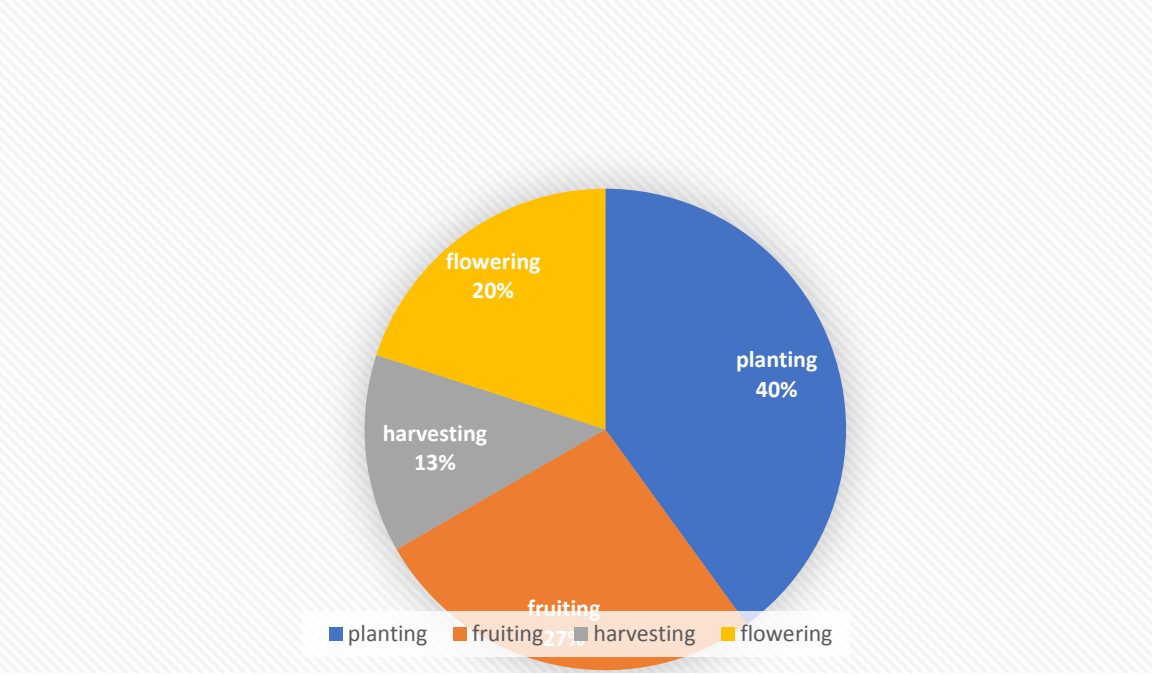

Table 3 shows a chart application times of PGRs

Chart 3: showing the application frequencies of PGRs

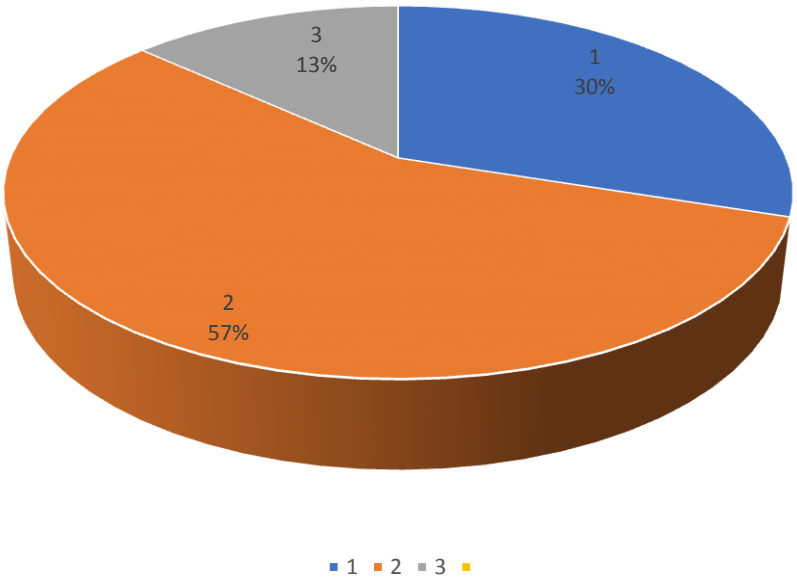

Table 4 chart summarizes the application frequencies of PGRs

NOTE: The numbers 1, 2, and 3 represent the frequency of application of PGRs

6.0. CHAPTER SIX: DISCUSSION RESULTS:

6.1. OBSERVATIONS FROM THE STUDY

The results analysis above shows that;

Ethephon and gibberellic acid are the most used PGRs

Most farmers apply the PGRs during planting and fruiting periods

Most farmers apply the PGRs two times during the growing period

Some farmers are not informed of the presence and benefits of using PGRs

Some claim their use is restricted and prohibited by the government so they tend not use these substances in fear of being imprisoned.

Some farmers claim they are poor so cannot meet the high prices of the PGRs. In fact, they claim they would wish to use such substances to boost their tomato and orange yields.

Some farmers claim it's a waste of time and money in applying PGRs as they think the soil itself is fertile enough to self- support the plants grown on it.

Some few farmers in the study area are informed about the existence of PGRs and their benefits in boosting tomato and orange yields however they bother less since even soil itself gives relatively good yields without necessarily applying PGRs.

Some farmers cry of the inaccessibility of shops and outlets selling PGRs as they recommend further decentralization of such outlets to increase the accessibility and hence the usage of PGRs

6.2. RECOMMENDATIONS:

Basing on the results from this investigation, the following ought to be done:

The outlets and shops selling PGRs should more centralized to boost access and hence usage of the PGRs. This shall ensure farmers easily access, buy, and use the PGRs in time during the growing seasons so as to collate with the different developmental stages of tomatoes and oranges.

Further research needs to be conducted about the potential risks of using PGRs tomato, orange, and adversely crop production. This would give the government information on which it can base to limit, boost, and even promote increased usage by perhaps regulating prices.

Farmers should apply PGRs at least twice the growing period of tomatoes and oranges as they ensure a relatively big quantity of the substances is used to counteract the increased demands of the plants and they should integrate several PGRs during a given application since their cumulative effects are far better if only one kind is used.

More sensitization and education of the farmers about the availability and benefits of PGRs is needed. This will make the substances known to the farmers so their use will increase and therefore boost tomato and orange yields.

6.3. CONCLUSION:

In summary, farmers in the study area use PGRs to a small extent; very few are informed and make good use of the substances. Most farmers lack information and even those who are informed have fear of government restrictions on the usage of PGRs.

The tomato and orange farmers in the study area also find financial hardships as in buying PGRs given they are relatively expensive.

Therefore, much sensitization, education and regulation of prices of the PGRs should be done by government in an attempt to boost their usage and so improve tomato, orange, and the yields of other plants.

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APPENDENCES

APPENDIX 1: SCHEDULE

BUSITEMA UNIVERSITY

FACULTY OF SCIENCE AND EDUCATION

NAGONGERA CAMPUS

BIOLOGY DEPARTMENT

ITEM: SCHEDULE.

Dear farmer, I greet you the name of the almighty God. I am Mulolo Steven, a year three student at the above university. This item (schedule) seeks information on the extent of usage of plant growth regulators (PGRs) in this area. I guarantee you that the information collected in here about yourself and the PGRs you use shall be kept confidential without any leakages to any public sources. I therefore, encourage you to openly and willingly respond to the questions in this item as this shall facilitate my research.

PART A: DEMOGRAPHIC INFORMATION;

Qn1. Tick your appropriate age bracket

18-24 years ☐ 25-40 years ☐ 41-50 years ☐ above 50 years ☐

Qn2. How long have you been growing oranges or tomatoes? Put the period in the space below

……

……..

……

……..

Qn3. Does the use of PGRs interfere with your marriage responsibilities?

Yes ☐ No ☐ I am not married ☐

Qn4. Tick your appropriate gender

Male ☐ Female ☐

PART TWO: MAIN BODY;

Qn5. Which PGR(s) do you use in growing tomatoes or oranges?

……
……
……
……
…….

Qn6. How often do you use PGRs?

……
……
……
……

Qn7. At what stage during plant growth and development do you apply the PGR(s)?

……
……
……
……

Qn8. Rumors are hard that there are restrictions on PGRs usage by agricultural officers and perhaps the government. Do you find it hard to integrate PGRs to boost yields into your farming?

APPENDIX 2: INTRODUCTORY LETTER

BUSITEMA UNIVERSITY

FACULTY OF SCIENCE AND EDUCATION

NAGONGERA CAMPUS

BIOLOGY DEPARTMENT

REF: MULOLO STEVEN

The above reference is a student of the above stated institution who is conducting a study on ascertaining the extent of usage of PGRs in Kakoli Sub County in Budaka district. As the institution, we grant him permission and also request whoever is concerned to allow collect data. We assure you that any information he will get from you shall be held with utmost confidentiality. We therefore request that you maximally cooperate with him.

We shall be grateful for your positive cooperation.

Supervisor's name: Madam Flavia Natukunda

Signature: ……..