IMPACT OF DARK ROOM ON THE SPROUTING OF PERCENTAGE OF HOT PEPPER

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ND/23/AGT/PT/0044

ND/23/AGT/PT/0141

ND/23/AGT/PT/0147

ND/23/AGT/PT/0155

ND/23/AGT/PT/0208

ND/23/AGT/PT/0226

BEING A RESEARCH PROJECT SUBMITTED TO AGRICULTURAL TECHNOLOGY DEPARTMENT, INSTITUTE OF APPLIED SCIENCE (IAS) KWARA STATE POLYTECHNIC ILORIN.

IN PARTIAL FULFILMENT OF THE REQUIREMENT FOR THE AWARD OF NATIONAL DIPLOMA (ND) IN AGRICULTURAL TECHNOLOGY DEPARTMENT.

JULY, 2025

CERTIFICATION

This project work has been examined and approved as meeting the requirements of Department of Agricultural Technology, Institute of Applied Science, Kwara State Polytechnic, Ilorin, Kwara State. In Partial Fulfillment of the Requirement for the Award of National Diploma (ND) in Agricultural Technology.

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EXTERNAL EXAMINER	**DATE**

DEDICATION

We dedicate this project firstly to God Almighty, for the opportunity He gave us to this very point in our life and studies. And also specially dedicated to our lovely and wonderful parent.

ACKNOWLEDGEMENTS

We would like to express our deepest gratitude to everyone who has played a significant role in the successful completion of this project.

Our sincere appreciation goes to my supervisor in person of **Mr. Samsudeen Adeshina** for his unwavering support, valuable guidance, and insightful suggestions, which were instrumental in shaping the direction and outcome of this work. His encouragement kept us focused and motivated throughout the journey.

Special thanks to our Head of Department **Mr. Bamijoko I.K.** for been there always and for his fatherly advice and word of encouragement always. Thanks for everything.

To our amiable and wonderful parent, we say a very big thanks to you all for your love, patience, and constant belief in us gave us the strength to push forward, even during challenging times.

Each contribution, no matter how big or small, has been deeply appreciated. This project would not have been possible without the support, time, and inspiration provided by all those involved.

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ABSTRACT

A field experiment was conducted to examining the impact of darkroom on the sprouting days and percentage rate, the experiment was placed in improvising box as darkroom and hot pepper seed was planted inside seed tray with replicates some inside dark box as darkroom while other are placed outside on a direct sunlight, bright day. There was in observation for the period of (24) twenty-four days as at 9^{th} days sprouting was observed on darkroom at 1% while non on day light experiment but as at 15 to 20 days about 12 to 18 sprouting which was about 37% was recorded in darkroom while that of daylight 10 to 25 sprouting with about 50% as at the end of the experiment it was observed the day light experiment had the highest percentage sprouting of about 99% to darkroom of about 82%, showed the hot pepper prefer daylight on sprouting level than darkroom.

CHAPTER ONE

1.1 Introduction

Hot Pepper Scotch Bonnet Pepper (capsicum annum) is one of the most important commercial crops in Nigeria. It is grown almost throughout the country. There are more than 400 different varieties of chill pepper found all over the world. It is also called as hot pepper. It botanical name is capsicum annum and also a herbaceous plant belonging to the family Solanaceae. It is an important vegetable crop that is grown throughout the world especially in the topic. Pepper has increased in popularity values and importance over a long period, thus making it an indispensable part of the daily diet of millions of Nigeria.(sources)

Scotch bonnet (capsicum annum is a wonderful vegetable crop that may be eaten raw or cooked. It is an important source of vitamin A, vitamin C and vitamin B6 it protects the body against disease attack and preventing health promoting disease (Amarzon 2012-2017). Today they are great commercial interest and are by one fourth of the global population (Barboza *et al.,* …2022)

Hot pepper have higher levels of capsicum than sweet pepper. The levels of heat of a hot pepper is ranked on scollive scale. Peppers with higher scollivie heat units (SHUs) are hotter, pepper can be produced in the field and under greenhouse farming using conventional and organic procedures. Conventional production of pepper in the field is easily adoptable by farmers because of it productivity in the short run (Dennis S. Ashilenje, Kitale, Kenya

2013) however the crop respond to both organic and in organic fertilizer which has been reported by several researcher (Aliyu 2002 Khan *et al.,* 2010) studies review that various crop response to inorganic fertilizer in different ways, the use of inorganic fertilizer could maintain or not maintain the higher yield in some crop, for example capsicum annum over the years shown emergence of micronutrient produce by this inorganic fertilizer which result in deteriorations of soil physical properties (Khan *et al.,* 2010).

1.2 Production of Scotch Bonnet Pepper

Previous researcher has reviewed the nutritional requirement of pepper as an antiodants and hypoglycanic activities (loizzo *et al.,* 2015) (Tundes *et al.,* 2013). The crops respond to both organic and inorganic fertilizer. Scotch bonnet pepper is a lucrative business in Nigeria the country has a favourable climate for cultivation of this pepper and the crop has a high demand in the local market and for export.

The price of pepper in Nigeria has been subjected to sessional fluctuation over time. In south western Nigeria, pepper has been massively convey from northern Nigeria despite the fact that it is also grown in the south west. This indicate that there is a great and urgent need for an increase in pepper production in Nigeria, especially in south western Nigeria.

The domestic demand for pepper has increased over time which has resulted in the decline in the quantity of pepper being exported in several producing countries. This signifies that there is a need for an increase in the

supply of pepper to make up for the increase in the domestic demand and to also give room for exportation.

It is worthy of note that despite the production level of pepper in Nigeria, pepper is still being imported. A general increase in pepper yield in Nigeria could be enhanced by the cultivation of improved cultivators (Jackson RD *et al.,* 2007)

1.3 Aims and Objectives

Impact of darkroom on the sprouting percentage of hot pepper seeds.

1.4 Specific Objectives

- To examine the sprouting days
- To compare sprout effectiveness on dark and light condition.
- To examine the sprouting percentage.

1.5 Statement of the Problems

The price of hot pepper in Nigeria has been subjected to seasonal fluctuation over time in south western Nigeria, pepper has been massively convey from northern Nigeria despite the fact that it is also grown in the south west. This indicate that there is a great and urgent need for an increase in hot pepper production to meet the heavy population and the production level as a great chart emerge as a result of unstable weather/climatic condition.

1.6 Justification

Hot pepper is referred to as “Atarhu” in Hausa, Atarodo in Yoruba, it is used as spices in preparing soups, spicy dishes or are used as medicines, cosmetic and plant insecticide according to (Take el at 2012, and Dognoto 2013).

CHAPTER TWO

LITERATURE REVIEW

2.1 Harvesting Scotch Bonnet

Scotch bonnet pepper grown for fresh use should be harvested when they are at good marketable size (10cm long)

Colour is an important item of quality therefore finite should be harvested when they are red or start to turn red. Harvesting can be done once or twice in a week so as to allow enough time for ripening with good care. Scotch bonnet pepper can remain productive for 2 years (Manlita *et al.,* 2020).

Peppers maturity is in time distant stages during their developmental stages, these stages are immature green, mature green, and mature red. It starts from immature green to mature green, pepper fruit increases in firmness and pungency the cell walls thicken and no colour change occurs. Mature green peppers are particularly developed and can be consumed fresh or in processed form. Harvesting of immature green peppers result in poor colour, flavour and short life span (Iyun B 2012). Mild fresh peppers grown for fresh use should be harvested when they are at good marketable size (10cm long and 5cm in diameter) with dark green colour. They should be firm and crisp but not so mature as to have begun losing their desirable greenness. Small young peppers are rather soft and yield readily to mild pressure of the fingers. Although quite edible at such stage, they are lacking optimum quality and food value.

Growers who harvest soft fruits will not be getting the potential yield from their crops (Gez Cornish and tom brabben 2007).

2.2 Processing and Preservation

Post-harvest is an integral part of agricultural production and utilization system, it is of importance in loss reduction, value addition, food security employment and income generation. Therefore, there is an urgent need for post-harvest technology revolution with strong linkages to proper processing, preservation, storage marketing and distribution of pepper fruit (Odeyemi o.o 2013) in appropriate post-harvest handling of pepper continues to result in varying degrees of losses. Handling must be seen as part of an integrated systematic approach aimed at improving quality of the final product (Kader A A 2008) Shriveling occurs due to moisture loss of about 4 percent or greater between 12 to 24 hours of harvest. Physiologically pepper fruit lack natural wax at immature stage which will hasten moisture loss and subsequently quality loss and mechanical damages such as abrasion cuts and bruises affect the chemical composition pericarp tissues of scotch bonnet fruit. Vitamin c content was lower by 15% in bruised locular tissue than in fruit without physical damage. (Morotti cl, sargent S.A, Huber D, Calbo AG, Puschman R 2000).

Peppers stored above 7.5ºc suffer water loss and shriveling storage below 7.5ºc is best for a maximum shelf life for 3-5 weeks. Pepper dried to safe moisture content packed tightly in sacks, can be stored in non-refrigerated warehouses for up to 6months. Storage under low temperature reduces loss of

red colour and slow down insect activities. Rapid precooling of harvesting pepper is essential in reducing marketing losses and this can be done by forced air cooling, hydro cooling or vaccum cooling. If hydro cooling is used care should be taken to prevent mold growth. Relative humidity of 60-70% is too higher, if the relative humidity is too low (below 10%), pod may be too little that they may shatter during handling, resulting in loss (Daramola Am, Okoye W.L 2000).

2.3 Method of Processing and Preservation

Method of processing are critical in presenting the benefit properties of capsicum among the vitamin ascorbic acid is very susceptible to chemical and enzymatic oxidation during the processing, cooking and storing of product. Unbalanced pepper lost more than 97% of their vitamin c within one month of freezing at 23ºc blacking reduces vitamin c content by 28% in vaccum sealed lost 10% in 12 months of storage (Hagg M, Hakkinen U, Kumpularen J, Ahuenanen R, Hurime E 2010, Daramola Am, Okoye wl 2011).

In an effort to reduce some of these loses, which cannot be thoroughly handled by other food preservation like canning, drying, refrigerating and heat pasteurization (Gee Harold MC 2010).

Method of Preservation

The preservation of peppers help in the following ways to increase the economic value of the product by transforming it from one form to another to remove inedible parts of product to improve taste to inactivate enzymes to make packaging easier to reduce the cost of transportation to make food

available where it is not produced to increase profit and to control shortage (Brecht J, Bergsma K, Sachez E, Snyder G 2000).

2.4 Protection Against Spoilage

Several flavour compounds were identified in fresh pepper and pepper mash 2 pentanoc, 3 hexanol acetic acid, ovic acid and linovic acid, howder the compounds 2 undecenal, farnesol, 2 pentacle, 1 ollinolenic acid and squalene are found only in the fresh pepper and not processed products. This suggested that the observed browning reactions in the mash could be an interaction of physio-chemical and microbial degradation but it is yet to be confirmed (Gorgus *et al.,* 2015). Spoilage in pepper mash may be induced by exposure to heat and fax oral route infections, or change to metabolic processes resulting in undesirable changes in texture, aroma, taste or appearance. More often spoilage is induced by exposure to air micro-organism (bacteria yeast and molds) or improper storage or conditiers (Bidgemohan *et al.,* 2018:2017).

Microbial spoilage in hot peppers products can be visible as mold growth embedded in a mass of filaments with brown colour change due to bacteria acidictation cause by L. megentroides (Kal 2000) listeria spp (quidensubsp, gasicomtatus L pisium (pothakos, vasilerious *et al.,* 2014) and elostidium perfungens and staphylococcus aurcus (Draughton *et al.,* 2004) the physio chemical changes are observed in the top layers as brown pigments. This may be both PH and temperature dependent. Increasing PH can affect the rate of non-enzymatic browning reactions as functions of temperature

(Gogus and Sami 2000) (Flures *et al.,* 2010) noted that while fermentation of chili pepper is dependent on several factors including microbial flora, non-desirable microbial growth could be controlling using caclz treatment (Lee, Jang and Hwang 2006).

2.5 Shelf-Life Management

Two third of the worlds population is inadequately fed and yet millions of kilograms of food and pepper are wasted each year as a result of poor and inadequate storage and handling facilities (Olorunda A.O and Abeeba F.O 2002). Fruit and vegetables like tomato and pepper are food items that are very vital in human diet, right from infants to the aged ones. The importance of these essential food items are very vital in human diet brought about their preservation in order to spread their availability throughout the year.

In the latest few years, many technologies, such as edible coating with anti-microbial agents, low temperature, high temperature, controlled atmosphere package and so on, have been developed in order to maintain the quality and safety of fruits and vegetables, which could prolong its shelf life during the storage and market periods (Youwei and Yinzhe 2013, Gualanduzzi *et al.,* 2009, yinshe and shaoying 2013). Loss in quality and quantity, the ideal storage temperature for fresh pepper is 45ºf (7.3ºc) but they will last about one week in a typical home refrigerator (which should be at 40ºf or 45ºc) fresh, whole pepper will last longer if they are kept dry.

Like most fruits and vegetables, peppers should be washed just prior to consuming or preserving, to wash, rinse well under clean, cold water gently

rubbing to remove dirt or soil microbial spoilage of food is a limiting factor for shelf life of fruit (Akinmushe 2011). In order to keep fruits and vegetables from losing their turgidity farmers or marketers often times sprinkle water on them after harvesting and the low temperature condition encourages the growth of micro-organism and this cause vegetable and fruit to spoil if not sold immediately (Murray *et al.,* 2017).

2.6 Value Addition

Peppers are a rich source of important vitamins minerals and nutrients which make them extremely beneficial to human health (Beanas N, Belovic M illie N, Moreno D 2019) locally in Nigeria the vast population of people consumes red scotch pepper only and some do remove the seed before grinding, the health benefits associated with the consumption of pepper and more importantly their therapeutic effects have been well documented (Natesh HN, Abbey L, Asiedu S.K 2017) vegetables are essential for food security and nutrition (Natesh HN, Abbey L, Asiedu S.K 2017) because of the vitamins, minerals, phytochemical components and dietary fibre, they contain are beneficial to human health (vigeret T.G Songur A.N arak o Calaroglu F.P 2018) peppers comes in a variety of kinds in the Nigerian market, capsicum genus has over 30 species, five of which (*C. Annum, C. Frutenous, C. Chinese, C. Baccatum* and *C. Pubes Cens*) have been domesticated and mostly farmed for human consumption (Garcia-gonzailez C.A Sivlar C 2020) pro vitamin A, vitamin E and C, carotenoids and phenolic substances such as capsaicinoids, luteolin and quercetin are all found in pepper. All these chemicals have

antioxidants properties and perform other biological function (Batiha G.E, Alqautani A ojo O.A shaheen H.M Wasef L 2020) in addition, pepper is the most widely use spice in the world, and it is prized for its spiciness and ability to enrich the flavour of a variety of dishes (Elzenity M. ismail M. shalaby M. Muritala T 2020). Pepper is an important commercial commodity that is used as vegetables, spices and in some value-added processed foods. Phyto chemical and vitamins such as vitamin A, vitamin C (Ascorbic acid), iron, vitamin B, carotenoids, niacun, riboflaxin, dietary fibre, flavonoids and magnesium are abundant in scotch pepper bonnet pepper (Guil-guencreo J.L, Martnez gurado 2000).

2.7 Availability of Hot Pepper

In Nigeria, hot pepper is referred to as 'Atarhu' in hausa 'Atarodo' in Yoruba. It is used as spices in preparing soups, sauces, spicy dishes or are used as medicines cosmetic and plant insecticide (Take *et al.,* 2012, Dognoko 2013). Fruit and vegetable production is limited in Nigeria to certain season and localities because they deteriorate a few days aafter harvest. Amongst the available vegetables, pepper (capsicum spp) is ranked third in the world (faosta 2012 mustapha *et al.,* 2021) in Nigeria pepper is the second most cultivated vegetable (Abu *et al.,* 2020) which used to average consumption per person per day is about 20% (ogunbo *et al.,* 2015). In combination with other agricultural produces almost 70% of the farmers and traders depend on pepper for food security. Scotch bonnet pepper is available year rounding with a peak season in the summer through fall.

2.8 Health Benefit of Scotch Bonnet

Capsicum ($C18H_27N0_3$) is an alkaloid compound believed to be found only in peppers. It is responsible of their characteristics hot taste or pungency the level depending on the concentration of capsicum in the fruit and is variable between species among fruits of the sme plant and among different parts of the same fruit (canton, flick *et al.,* 2008) habitually people eat this botanical spice in raw, dried and cooked from and it is also used in making paste, pickle, and sauce. Although from place the name and the type of capsicum bemics vary greatly in colour, shape, size, appearance, flavour and pungency. (Gomez Garcia MD, ochoa-alyo N 2013) surprisingly, approximately 35 species of capsicum exist in nature only five have been domesticated for human consumption, namely, capsicum annum (ancho/poblamo, bell, cayenne) capsicum baccatum, capsicum chinese, capsicum, fruitsen and capsicum fruitsen. (Carrizo Garcia c, barfuss MH, sehr EM, Barboza GE 2016) of these species, the capsicum annum is the most economically important cop due to its pungent odour and taste.

The placenta tissue and seeds of scotch bonnet pepper (c. annum) are reported to contain most of the capsicum with 62 and 37% respectively (Gonzalez *et al.,* 2009) capsicum benefit include anticarcinogenic, anti-oxidant, anti-mutagenic, immune suppressive, hypocholesterolemia and bacterial growth inhibition effects (Grubben and El Tahir 2006) in traditionally medicine, hot pepper is used to ease digestion, stimulate the gut, combat constipation and reduce pain capsicum may have also a potential role

in the development of pain killing agents (Patwardhan *et al.,* 2010). Since pepper are easy to grow, harvest, process and utilize, efforts should be undertaken by extension worker nutrition.

CHAPTER THREE

MATERIALS AND METHODS

3.1 Materials

- Improvising box and darkroom
- Seed tray/polythene bags
- Hot pepper seed
- Growth medium(cocopeat)
- Spraying cana
- Hydrogen perodixer
- Big bowl as water container

3.2 Preparation of Nursery Seed Tray

The nursery stage comprised of seed tray, cocopeat, as the growth medium, pepper seeds. The preparation was by sterilizing of the seed tray with hydrogen perodixes solution and those materials were deep inside for some minutes then the seed tray were filled with growing medium (cocopeat) and irrigate the filled tray with water till point of saturation or socked with water for easy sprouting.

3.3 Experimental set up

Since we are comparing the impact of darkroom to open areas or field the sprouting percentage, a big box container were constructed of about 24_{cm} by 120_{cm} parameter size with a cover and size seed trays were given the same

treatment in terms of filled work cocopeat, wetting and planting of hot pepper seed were placed inside the box and well covered to create deserved darkness while other are placed outside and be observed for the next three to five days to determine the sprouting percentage.

3.4 Irritation methods

On the experimental set up, the irritation was carried out three times daily with enough water for both set up those inside the dark room/box and outside water supplied was timed, the first wetting in the morning 8:am, second in the noon 12:pm and third wetting afternoon 3:pm till the time of appreciable sprouting was appeared.

3.5 Source of hot pepper seeds

The seeds are derived from purchases fresh hot pepper and we dissect it to get the seeds inside and we used wood ash as protectives and preserved material for possible viability. The seeds was placed on open air for dryness for two days then we use as planting material for the experiment to determine the sprouting percentage.

3.6 Data collection on sprouted percentage

Hot pepper seeds & seed tray

Table I

A

Dark room

B

Open lighted

Table II

Dark				**Light**			
Days	No Sprouted		%	Days	No Sprouted		%
3	F -	CF	-	3	-		-
6	-		-	6	-		-
9	1		-	9	-		-
12	6	7	-	12	15		-
15	12	19	-	15	10	25	-
18	18	37	-	18	25	50	-
21	30	67	-	21	25	75	-
24	15	82		24	24	99	

CHAPTER FOUR

4.0 Result and Discussion

4.1 Data analysis

Table II above expressed the relationship between the sprouted number 4 days and the number of seeds sprouted as the frequency.

It is showed that sprouting was observed on the nineth day in the dark room with a seed sprouted, while there was none on experiment B-light condition. The reading and data was observed and collected at three days internal according to table II in chapter 3.5 above.

As at 24days, additional (15) fifteen sprouted seeds was observed to the previous number on the frequency column and the cumulative frequency read 82 on experiment. A dark room while on experiment B light condition at 24 days additional 24 sprouted seeds to the previous and the cumulative frequency column reads 99.

4.2 Sprouting Percentage

Experiment A darkroom

As at 24day 82 seeds was sprouted.

Therefore the sprouting percentage was

$$\frac{82}{100} \times \frac{100}{1} = 82\%$$

Experiment B light condition

As at 24days 99 seeds was sprouted, therefore the sprouting percentage was

$$\frac{99}{100} \times \frac{100}{1} = 99\%$$

CHAPTER FIVE

5.1 Recommendation and Conclusion

According to the result analysis in chapter four, it was shown that hot pepper response to lighting environment in term of sprouting level or percentage than dark room condition, as a result of this we are hereby recommended all hot pepper producer (farmers) to adapt lighting condition on sprouting nursery condition than dark room for better and fast result.

5.2 Conclusion

The experiment shown the lighting environment or condition is the best nursery system of hot pepper.

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