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Technical Information on Onions and their Post-Harvest Disease Management

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Abstract- Onions (Allium cepa) are a vital horticultural crop with a significant economic impact worldwide. Understanding the respiratory dynamics of onions during storage is crucial for optimizing post-harvest management and minimizing losses due to diseases. This technical information abstract explores the respiration rate of onions and effective strategies for post-storage disease management. The respiration rate of onions is a key physiological parameter that reflects the metabolic activity of the bulbs during storage. It is influenced by factors such as temperature, humidity, and storage conditions. Monitoring and controlling the respiration rate is essential for extending the shelf life of onions and preserving their quality. Post-storage diseases, including bacterial and fungal infections, pose a significant challenge to onion storage. This abstract discusses advanced techniques and technologies for disease detection and management. It explores the use of controlled atmospheres, modified atmospheres, and natural compounds to inhibit microbial growth and maintain onion freshness. Additionally, the abstract addresses the importance of integrated pest management (IPM) strategies in preventing post-storage diseases. This involves a combination of cultural, biological, and chemical control methods to create a holistic approach to disease management.

Index Terms- Onion, vegetable crops, disease, atmospheric, post-harvest, temperature, plants, cell.

I. INTRODUCTION

1. Respiration Rate (Benkeblia et al.,2000)

In the context of onions, respiration rate describes the method by which onions continue to go through metabolic processes including the exchange of gases after harvest. In this process, oxygen (O2) is taken in and carbon dioxide (CO2) and water vapor (H2O) are released.

To supply energy for the plant cells, stored resources in onion tissues, mostly carbohydrates, are broken down by a number of metabolic processes. Like other plants, onions store their nutrients in complex chemical compounds, mostly sugars and starches. These nutrients are stored and then released during times of high energy demand or throughout the onion's growth and development process. The result is adenosine triphosphate (ATP), which the cells employ for a variety of biological processes.

2. RQ, Ea & Q10 Calculation

The respiratory quotients (RQ=RRCO2/RRO2) were computed at any temperature using the following equation, which was derived from raw data for all temperatures: RQ(T)=RQ[Q10C02]/[Q10O2] ×7/10

T=temperature (C degree)

Q10O2 and Q10CO2=Q10 OF RRO2 or RRCO2

RQ0=respiratory quotient at 0 degree CQ10 was determined by plotting log(rr) against temperature (T): Log (RR)= aT+ b.

The respiration rate at 0 degree C (RR0) may be calculated from the b coefficient (RR0=10b) and Q10 from a coefficient.

Activation energy (Ea) as described by Labuza is based on an Arrhenius equation:

In (RRT)=-E/R×1/(T+273) +In (RR0)

RRt= respiration rate at T (mmole /kgh)

T=temperature (C degree)

Ea = activation energy (J /mole)

R=gas constant (8.3J/moleK)

3. Heat (Tripathi et al.2000)

The heat production by stored onions is calculated by the following formula: Heat production (kcal/t/day) = ml CO2/Kg x122

II. MOISTURE CONTENT LOSS

To calculate the onions' initial and final weights as well as their initial and final moisture content, it is necessary to calculate the moisture loss in onions when they are stored in a cold room.

Moisture Loss = Initial Moisture Content-Final Moisture Content/Initial Moisture Content is the formula used to calculate moisture loss.

However, you will need the beginning and end weights of the onions, together with the initial and final moisture content percentages, to utilize this calculation. It is impossible to determine the precise amount of moisture loss without these particular numbers.

II. GASES THAT ARE RELEASED FROM ONION CELLS DURING THE STORAGE PERIOD

Onions experience respiration during storage, just like many other plant products. Cells absorb oxygen (O2) and emit carbon dioxide (CO2) and water vapor (H2O) during respiration, a metabolic process. Even after the onion has been harvested, its cells go through this process as they metabolize and decompose the nutrients they have accumulated to keep their cells functioning. Onions and other plant materials may release other gases during storage, such as ethylene (C2H4), in addition to carbon dioxide and water vapor. A natural gas and plant hormone, ethylene, can affect how quickly fruits and vegetables ripen. Like many other plant items, onions breathe as they are being stored. Cells use respiration, a metabolic process, to absorb oxygen (O2) and release carbon dioxide (CO2) and water vapor (H2O). This process is carried on by the onion's cells even after they have been harvested, as they metabolize and break down the nutrients, they have collected to maintain the health of their cells. Along with carbon dioxide and water vapor, onions and other plant components may emit additional gases during storage, including ethylene (C2H4). The rate at which fruits and vegetables mature can be influenced by the plant hormone ethylene, a natural gas. This is essential forr controlling the ripening process of many crops and can affect the quality and shelf life of products. The particular gases released during onion storage can be influenced by a variety of factors, including temperature, humidity, and storage conditions. By adopting controlled-atmosphere storage techniques and enough ventilation to lower the amount of these gases present, onions and other perishable commodities may be preserved for extended periods.

1. Major Storage Diseases of Onions

The major storage diseases of onions include:

- bacterial rots
- black mould
- blue-green mould
- fusarium rot
- neck rot.

The particular gases, such as carbon dioxide (CO2), methane (CH4), ammonia (NH3), hydrogen sulfide (H2S), mycotoxin, and volatile organic compounds (VOC), generated during onion storage illnesses

Carbon Dioxide (CO2)
One typical consequence of bacterial metabolism is carbon dioxide (CO2). Increased carbon dioxide concentrations can be a sign of microbial activity and organic matter breakdown.

Methane (CH4)
While organic material decomposes, some bacteria create methane in anaerobic (low oxygen) environments. Carbon dioxide, as opposed to methane, is more likely to be produced when bacteria degrade plant tissue.

Ammonia (NH3)
Certain bacteria can emit ammonia as they break down proteins. It smells strongly and strongly of smelly material that has decayed.

Hydrogen Sulfide (H2S)
Bacteria may convert sulfates to hydrogen sulfide, which has a rotten egg odor, in anaerobic settings. In large quantities, this gas can be hazardous because of its toxicity.

Volatile Organic Compounds (VOCs)
Bacterial rot can lead to the production of various volatile organic compounds, some of which can contribute to unpleasant odors associated with decay.

Table .1 .The information about different storage diseases, Causal organisms, and Symptoms.

9 Storage Disease	Causal Organism	Symptoms
Bacterial rots	Pseudomons and Ewinia spp.	Strong-smelling, watery rot of the bulb
Black mould	Aspergillus spp	Sooty block masses under surface scales
Blue-green mould	Penicillium spp.	Dusty green masses under surface scales
Fusarium rot	Fusarium spp.	White, fluffy growth and soft rot at the base or neck of onion
Neckrot98	Botrytis spp.	Dusty grey mould and rot in the neck of the bulb.

Mycotoxins
Fungal infection, particularly during storage, can cause onions to become contaminated and produce mycotoxins. Mycotoxins are hazardous by products of fungal metabolism. However, depending on the type of fungus present, storage circumstances, and other factors, different mycotoxins may be formed during the storage of onions.

Aflatoxins
The fungus Aspergillus flavus and Aspergillus parasitic us

create aflatoxins. Although they are more frequently linked to cereals and peanuts, in some situations they can also contaminate onions and other crops.

Ochratoxins
Many Aspergilli and Penicillium fungal species generate ochratoxins. Although they are frequently found in grains, they can infect a range of food products, including onions, when they are being stored.

Patulin
Certain species of Aspergillus and Penicillium create a mycotoxin called patulin. It can also be present in preserved vegetables like onions. It is typically detected in decaying fruits.

Fusarium Toxins
Numerous Fusarium species are capable of producing trichothecenes, zearalenone, and fumonisins, among other mycotoxins. Onions are among the many crops that can become contaminated by these chemicals.

It is noteworthy that the existence and kind of mycotoxins in onions that have been preserved are contingent upon several circumstances, such as the initial degree of fungal infection, storage conditions (such as temperature and humidity), and the length of time the onions are stored.

The greatest source of accurate information on mycotoxin contamination in onions during cold storage is specialized research studies or publications related to mycotoxin analysis and food safety. Current and comprehensive information on this subject may be found in reports from food safety groups, research papers, and scientific publications.

III. MANAGEMENTAL PRACTICES IN MAJOR STORAGE DISEASES OF ONIONS

1. Bacterial Rot
Symptom
The onion tissue deteriorates and smells bad due to bacterial soft rot. Supervisory:

Sanitation
Make sure everything is clean before handling and storing. Eliminate and dispose of contaminated bulbs.

Drying
After picking onions, thoroughly dry them to stop bacterial development.

Proper Ventilation
To lower humidity and moisture in storage spaces, provide enough ventilation.

2. Black Mold
Fungicides
Sprays for Prevention
Use fungicides before storage as a safeguard. Seek advice from specialists in agriculture on appropriate fungicides and adhere to the suggested treatment protocols.

3. General Tips for Onion Storage
Curing
After harvesting, cure onions for two to three weeks in a warm, well-ventilated place to toughen the outer layers.

Temperature and Humidity
Onions should be kept dry and cold. 32–40°F (0–4°C) and 65–70% humidity are the ideal storage conditions.

Inspect Regularly
Check stored onions often for rot or illness, and remove any afflicted bulbs right away to stop the spread of the disease.

Table 2: Different factors impacting the post-harvest losses in onion

Physiological activity	Biochemical activity	Microbial invasion
Transpiration	Enzymatic	Fungi
Respiration	Softening of tissues	Bacteria
Senescence		
Sprouting		

Black mold and Fusarium basal rot of onions, caused by Aspergillus niger and Fusarium oxysporum f.sp. cepae, are the most destructive diseases of onions in storage, causing losses of about 80 percent and more than 50 percent, respectively. The fungicides evaluated in vitro were found to be fungistatic or antifungal against both pathogens. In A. niger, the most effective fungicides with significantly higher mycelial growth inhibition were SAFF (94.55 percent), carbendazim (92.22 percent), and mancozeb (90.98 percent). The bioagents viz., T. viride (85.61 percent) and T.harzinum (82.19 percent) were found to be potential antagonists against A.niger. The two most damaging diseases to onions in storage are black mold and fusarium basal rot, which are brought on by Aspergillus niger and Fusarium oxysporum f.sp. cepae, respectively, and result in losses of over 50% and 80%, respectively. It was discovered that the fungicides tested in vitro were either fungistatic or antifungal against both infections. With much greater mycelial growth inhibition in A. niger,

SAFF (94.55 percent), carbendazim (92.22 percent), and mancozeb (90.98 percent) were the most effective fungicides. Anticipating possible antagonistic effects against A.niger, the bioagents T. viride (85.61 percent) and T. harzinum (82.19 percent) were identified. The fungicides hexaconazole, SAFF, mancozeb, and carbendazim were shown to be the most effective against Fusarium oxysporum f.sp. cepae, exhibiting considerably higher rates of mycelial growth suppression (91.73 percent, 91.39 percent, 90.82 percent, and 88.42 percent, respectively). The bioagents with the strongest mycelial growth inhibition were T. viride (88.1 percent) and T. harzianum (81.55 percent).

3. Trichoderma Viride

One species of fungus in the Trichoderma genus is Trichoderma viride. It is often employed as a fungicide, biopesticide, and plant growth stimulator in horticulture and agriculture. Trichoderma species are recognized for their capacity to form symbiotic connections with plant roots, augmenting plant development and shielding plants against diverse diseases.

In particular, Trichoderma viride is utilized to biologically reduce fungal-induced plant diseases. It keeps dangerous fungus from infecting plants by outcompeting and parasitizing them. This biocontrol agent is a popular ecologically acceptable substitute for conventional pesticides in organic farming and sustainable agricultural methods.

Commercially accessible trichoderma viride treatments are used to control diseases in a variety of crops, including fruits, vegetables, ornamental plants, and other crops.

Trichoderma viride promotes plant health and suppresses disease, which helps environmentally friendly and sustainable farming operations.

Table.3.In vitro effect of different fungicides on mycelial growth and inhibition of a.niger

S.No	Treatments	Conc(%)	Colony diameter(mm)	Percent inhibition
1	Carbendazim	0.1	7.00	92.22
2	Mancozeb	0.25	8.11	90.98
3	Benomyl	0.1	8.73	90.29
4	Topsin	0.1	9.00	89.99
5	Captan	0.25	9.22	89.75
6	Hexaconazole	0.1	12.89	85.67
7	Plantomycin	0.5	72.99	18.89
8	Streotocycline	0.5	80	11.11

Systemic Fungicides

A kind of fungicide known as systemic fungicides is absorbed and translocated inside the plant, offering defense against fungal infections from the inside out. Systemic fungicides are absorbed by the plant's vascular system and dispersed throughout the plant's tissues, including the leaves, stems, and roots, in contrast to contact fungicides, which stay on the plant's surface and guard against outside infection. New growth and plant sections that are not treated directly are protected by the fungicide's internal movement throughout the plant.

Table.4.In vitro effect of different fungicides on growth and inhibition of Fusarium oxysporum f.sp.cepae.

S. No	Treatments	Conc (%)	Colony diametr (mm)	Percent inhibition
1	Carbendazim	0.1	10.42	88.42
2	Mancozeb	0.25	8.26	90.82
3	Benomyl	0.1	15.54	82.73
4	Topsin	0.1	15.44	82.73
5	Captan	0.25	16.43	81.74
6	Plantomycin	0.5	78.94	12.28

Table.5. Different fungicides and their concentration and disease.

Fungicides with Concentration	Disease
Benomyl at 0.2%	Onion anthracnose
Carbendazim and captafol at 10 or 15g/20 liters	Onion anthracnose
thiophanate methyl	Onion twister
Mancozeb at 0.25%	Onion anthracnose
thiophanate methyl 50% and thiram 30% WP and thiophanate methyl 70%WP, and chlorothalonil 70%WP	Onion leaf twister
Mancozeb, carbendazim, propiconazole, and thiophanate methyl at 0.1%	Onion twister-anthracnose
Hexaconazole at 0.1%	Onion twister
Captan, mancozeb/benomyl /propiconazole	Onion anthracnose
Triazoles with gibberellin inhibitor	Onion anthracnose
thiophanate methyl	Onion anthracnose
Trifloxystrobin and tebuconazole, pyraclostrobin and fluazinam 500 g/L sc	Onion anthracnose
Dithane or mancozeb or chlorothalonil or strobilurin fungicides, quadris, and Cabrio	Onion anthracnose
Propicanozole at 0.1% and iprobenfos at 0.15%	Onion anthracnose
Mancozeb 0.25% and tricyclazole 0.1% and hexaconazole 0.1%	Onion twister

Because systemic fungicides offer more thorough and long-lasting protection, they are especially helpful in managing fungal infections that are difficult to treat with contact fungicides alone. They work well against illnesses brought on by pathogens that infiltrate plant tissues and are hard to eradicate.

Systemic fungicides are valuable tools in integrated pest management strategies, helping farmers effectively manage fungal diseases and minimize crop losses. However, it's essential to use them responsibly, following proper application guidelines and considering potential environmental impacts.

Fungicides used on onions typically contain active ingredients designed to target specific fungal diseases that affect onions. The choice of fungicide and its formulation can vary based on the specific fungal pathogens prevalent in a region. Common active ingredients found in fungicides used on onions include Different kinds of systemic fungicides exist, such as:

Combined Fungicides
A fungicide product with many active ingredients is referred to as a "combination fungicide". These fungicides provide a complete solution for managing fungal infections in a variety of crops since they are designed to target a wider range of fungal illnesses.

Combination fungicides increase efficacy and lower the possibility of fungus becoming resistant to particular compounds by mixing several active agents with various mechanisms of action. The active ingredients in the combination fungicide have the potential to operate on distinct metabolic processes within the fungus or target distinct phases of the fungal life cycle. This multifaceted strategy improves overall disease management and aids in the control of a greater variety of illnesses. For example, a combination fungicide might contain two or more active ingredients, such as

Mancozeb: is beneficial against blights and mildew.

Azoxystrobin: A fungicide with strobilurin that works well against powdery mildew and rust. Propiconazole is a triazole-based fungicide that works well to combat a range of fungal diseases.

Mancozeb: Effective against a variety of fungal infections, Mancozeb is a broad-spectrum fungicide. It is frequently used with onions to prevent fungalinfections and illnesses like downy mildew. Manganese (Mn) and zinc (Zn) are the two primary components of mancozeb, a fungicide and plant protectant. These two metal ions combine to form the coordination complex known as mancozeb, which has the organic molecule ethylene bis dithiocarbamate (EBDC) acting as a ligand. Mancozeb's chemical formula is typically written as (Zn, Mn)$C_4H_6N_2S_4$.

Mancozeb is a well-liked fungicide in agriculture because of its unique mix of zinc and manganese, which effectively inhibits a variety of fungal infections on a variety of crops.

Chlorothalonil: Another broad-spectrum fungicide that is used to manage fungal infections in onions, such as rusts and leaf blights, is chlorothalonil. A typical broad-spectrum fungicide used to manage fungal infections on a range of crops is chlorothalonil. With the chemical formula $C_8Cl_4N_2$, it is a complicated organic molecule. Chlorothalonil is a single chemical molecule made up of carbon (C),

chlorine (Cl), and nitrogen (N) atoms, as opposed to certain other fungicides that comprise combinations of components. The substance is efficient against a variety of plant diseases, including several fungal infections, and is a member of the chlorinated aromatic compound class of chemicals.

Propiconazole: One systemic fungicide that is used to manage diseases like onion rust and purple blotch is propiconazole. It is taken up by the plant and offers defense from inside the tissue of the plant.

Copper-Based Fungicides: Copper-based fungicides, such copper sulfate or Bordeaux mixture, are used in both conventional and organic agriculture to control fungal diseases. Copper compounds can be used as an efficient treatment for diseases like onion downy mildew.

Myclobutanil: Myclobutanil is a systemic fungicide that controls a variety of fungal diseases, including powdery mildew and rust, by stopping the growth of fungal cells.

Azoxystrobin: For the proper and safe application of fungicides on onion crops, farmers should always heed the manufacturer's advice and guidelines. It's important to keep in mind that active ingredients and fungicide formulations might differ. Additionally, based on the region and prevalent diseases in the area, local experts or agricultural extension organizations can provide customized guidance. Azoxystrobin is a fungicide that belongs to the strobilurin class and is used to treat diseases like onion white rot.

IV. POST-HARVEST WASTE CAN BE CONTROLLED BY USING CHEMICALS

Calciump chloride is often used in food processing and preservation to extend the shelf life of several products, including onions. Calcium chloride, in particular, has several ways to increase the shelf life of onions:

1. Firmness
Texture: The cell walls of onions are strengthened by calcium ions, giving them a stronger texture. This additional hardness

guards against bruising and mechanical damage during handling and transit, both of which can cause spoiling.

2. Reducing Microbial Growth
The growth of bacteria that cause spoiling and decay can be halted by calcium chloride, keeping onions fresher for longer. It does this by making the surroundings unfriendly to fungus and bacteria.

3. Enzymatic Browning
When onions are sliced or harmed, their enzymes create browning. These enzymes may be inhibited with calcium chloride, which can delay browning and keep the onions looking good for longer. This is especially crucial for processed or pre-cut onion products.

4. Osmotic Balance
By assisting in the maintenance of the osmotic equilibrium inside cells, calcium chloride can help onions retain more water in their tissues. Maintaining the onions' natural wetness and crispness is essential to their quality and shelf life and may be achieved by proper hydration. When using calcium chloride to extend the shelf life of onions, it is essential to follow recommended guidelines and concentrations to ensure food safety and quality. Additionally, proper storage conditions, such as temperature and humidity control, also play a crucial role in preserving the freshness of onions and other perishable products.

Table 6. Different concentrations of fungicides are used for the management of Black mold rot of onion.

Fungicides	Concentrations (ppm)			
Carbendazim 50WP	125	250	500	1000
Bitertanol10WP	125	250	500	1000
Myclobutanil 25W	125	250	500	1000
Hexaconozole5Ec	125	250	500	1000
Mancozeb75WP	500	1000	1500	2000
Captan50WP	500	1000	1500	2000
zineb75WP	500	1000	1500	2000

Effect of Pretreatments o;[pn Quality Of Purple Shallot
Generating a chemical solution Calcium chloride (CaCl2) was used on a percentage basis in distilled water to perform the chemical pretreatment of purple shallot (0.25, 0.50, and 0.75%)..

Mild Heat and Chemical Combination Pretreatment.
As recommended by Thuy et al. (2013), 500 g of the prepared sample were dipped in the corresponding prepared chemical solution (as mentioned above) at various temperatures (45, 50, and 55°C) in the water bath for 10 minutes to examine the effects of the combination of thermal and chemical pretreatments on purple shallot halves using calcium chloride (CaCl2). The samples were blanched, cooled in cold water, and any remaining water was blotted using tissue paper before they were dried. Three independent analyses of purple shallot's hardness, bioactive components, and antioxidant activity were conducted.

Table.7.Effect of different concentrations of fungicides on the lesion diameter of Aspergillus niger

Treatment	Concentration	Lesion diameter after incubation		%diameter of rot concerning control	% age reduction over control
		4days	8 days		
Bitertanol	1000ppm	24	3.6	68.19	31.82
Carbendazim	1000ppm	0.00	0.00.	0.00	100
Hexaconozole	1000ppm	0.00	0.00	0.00	100

Table.8.Effect of systemic fungicides on spore germination

Concentration Treatment	Spore germination (%)				
	0.0	125ppm	250ppm	500ppm	1000ppm
Carbendazim	95.20p	58.23	47.8	33.89	24.89
Bitertanol	92.52	53.8	39.55	33.50	25.89
Myclobutanil	91.77	59.55	51.77	44.87	31.88
Hexaconozole	90.34	45.99	34.88	35.99	9.77

Table.9. Effect of non-systemic fungicides on the spore germination

Concentration Treatment	Spore germination %				
	0.0	500ppm	1000ppm	1500 ppm	2000 ppm
Mancozeb	89.42	22.57	16.55	9.10	0.00
Captan	71.02	28.37	24.01	17.56	0.00
Zineb	91.53	51.44	43.12	35.91	21.78

Table.10.Effect of fungicidal dips and applied as a pre-inoculation treatment on the severity of Aspergillus rot

Treatment	Concentration	Rot severity (%) after incubation			
		4th days	8th days	12th days	16th days
Carbendazim	1000ppm	0.00	1.07	4.50	13.69
	500ppm	2.05	7.25	11.38	20.96
	250ppm	4.21	9.80	12.99	25.95
Hexaconozole	1000ppm	2.5	6.92	12.56	21.40
	500ppm	9.36	15.70	23.72	21.40
	250ppm	17.82	23.35	29.50	32.27
Myclobutanil	1000ppm	13.26	21.53	31.69	41.59
	500ppm	21.36	27.65	34.23	40.71
	250ppm	22.8	31.55	43.88	51.88

Chlorine Dioxide

In order to inhibit fungal development and increase the shelf life of stored onions, chlorine dioxide as an antifungal agent usually entails treating the onions or the storage environment

Fumigation of Storage Area

The storage space where onions are kept can be fumigated using chlorine dioxide. In order to get rid of surface and airborne fungus, this entails pumping chlorine dioxide gas into the storage area. The gas may permeate a variety of surfaces and reach places that would be challenging to treat using conventional techniques.

Treatment of Onion Bulbs

Chlorine dioxide solutions can be used to treat onion bulbs directly. To lessen the possibility of fungus infestation, this can entail cleaning the onions with a weak chlorine dioxide solution. This is especially important if soil leftovers or other possible sources of fungal spores were present when the onions were harvested.

Control of Ethylene Gas

Ethylene gas levels in storage facilities can be managed with the aid of chlorine dioxide. One naturally occurring plant hormone that can quicken the ripening of fruits and vegetables—including onions—is ethylene. Chlorine dioxide may indirectly aid in preventing fungal development and prolonging the shelf life of onions by regulating ethylene levels.

Fogging or Spraying

Solutions containing chlorine dioxide can be sprayed or fogged inside the storage space.

By accessing different surfaces and avoiding fungal contamination, this technique helps to provide a more uniform dispersion of the antifungal medication

Onion Treatment

Lower quantities of the chlorine dioxide solution, usually in the range of a few to several hundred ppm, may be used for treating onions directly. The precise concentration will vary depending on a number of variables, including the targeted fungus, the length of contact, and how susceptible onions are to chlorine dioxide.

For information on suggested concentrations and application techniques, always consult the technical specifications and directions included with the product. Additionally, abide by local laws and policies pertaining to food safety

It's crucial to remember that using chlorine dioxide should be closely regulated, and safety precautions should be taken to minimize any possible hazards. Onions kept in storage may not be as safe or of high quality if they are used improperly or in excess. To create a secure and efficient plan for utilizing chlorine dioxide in onion storage, confer with experts in food safety and preservation.

Solution

To sum up, this thesis has explored the complex dynamics of onion respiration rates and the subtle tactics used to manage post-storage diseases. One important physiological metric that may be used to accurately predict metabolic activity during storage is the onions' respiration rate. Our investigation into this aspect has shed light on the complex interactions between environmental elements and has provided important information for improving storage conditions and prolonging the shelf life of onions. This thesis's second main focus was on post-storage illness management, which acknowledged the difficult problems caused by bacterial and fungal diseases. Through an analysis of cutting-edge technologies including modified atmospheres, regulated atmospheres, and the use of natural chemicals, we have delineated practical strategies to counteract microbial growth and preserve the quality of onions that are preserved. In addition, a viable option for reducing the risk of post-storage illnesses is the combination of holistic approaches through integrated pest management (IPM), which combines chemical, biological, and cultural controls.

This thesis highlights the multidisciplinary nature of post-harvest onion preservation as we traverse the complex interplay between respiration dynamics and disease management. The information provided here adds to the corpus of knowledge that can direct scientists, farmers, and other industry participants toward better storage techniques. These findings are critical to solving global food security issues by promoting a robust and sustainable onion supply chain.

Essentially, this thesis is a thorough resource that establishes the foundation for future investigations, technical advancements, and real-world uses targeted at improving onion storage, cutting down on losses, and guaranteeing the ongoing supply of this vital vegetable crop. This thesis aims to be a stepping stone in the process of establishing onion post-harvest procedures, which are shaped by the delicate balance between disease management and respiration dynamics.

V. CONCLUSION

In conclusion, this technical information abstract provides insights into the respiration dynamics of onions during storage and outlines effective measures for post-storage disease management. The knowledge presented here is valuable for researchers, agriculturists, and industry professionals seeking to enhance onion storage practices, reduce losses, and ensure a sustainable supply chain for this essential vegetable crop.

A holistic approach combining curing, proper storage, hygiene practices, fungicide application, and careful handling is paramount for effective post-harvest disease management in onions. Implementing these measures collectively ensures an extended shelf life, reduces losses, and maintains the overall quality of the onion produce.

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