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Onion Storage and Dryer

Solimar F.Moradas [1], Elmer S.Sealongo[2]
[1] *Faculty, Iloilo Science and Technology University Miagao Campus, Miagao, Iloilo, Philippines*
[2] *Faculty, Iloilo Science and Technology University Miagao Campus, Miagao, Iloilo, Philippines*
Email Address: solimarmoradas@gmail.com[1]; elmersantamenasealongo@gmail.com[2]

ABSTRACT

The constructed Onion Storage and Dryer was assembled. Intended to store onion bulbs for household consumption. A developmental approach was utilized. A model determines requirements and parameters, design, prototype, testing and implementation, refinement and maintenance. The constructed storage and dryer was subject to evaluation as to design, portability and efficiency. Meantime, the design and portability issue was established. The efficiency will be observed year round to give reliable results. The evaluation results as to design of Onion Storage and Dryer as evaluated by household members rated design Very Acceptable description. As to portability of the device, the rated mean description of Very Acceptable. Thus, the completed Onion Storage and Dryer satisfy the needs of the household users. The constructed onion storage and dryer was capable of maintaining the dryness of onion bulbs to protect for rotten. The storage and Dryer was responsive to the condition especially during handling of onions during cooking activities, temperature of the area, moisture content of the area. The Onion Storage and Dryer can be utilized in areas attributing the same temperature and moisture content condition. The Onion storage and dryer operate in varied conditions depends on the temperature and moisture content of the location areas.

Keyword: *"Onion Storage", "dryer"*

1. INTRODUCTION

Onion storage and dryer is one of the solution in keeping onion bulbs. When it is properly stored, good varieties, such as Copra and Sweet Sandwich, can be successfully stored for several months. Poor varieties, such as Walla Walla and Sweet Spanish, can only be stored for a few weeks. It is advisable that the storage temperatures are not too warm, in order that the onions may not sprout. Rotting may be a problem in damp locations. Inspect the stored onions on a regular basis in fall especially in rainy season.

Most household users do not purchase bulk volume of onion bulbs because of some problems they encountered. They usually claim that they have no standard storage container that can hold several volumes of onions that they can use to consume for a year round as part of savoury ingredient for daily food preparation. Another problem was some insects attracted to onions and make the bulb rotten little by little until more of the onions gets affected. In weather and temperature conditions, our country Philippines have two seasons, dry and wet season wherein onions are affected during storage.

With these problems cited above, inspired the researcher to develop prototype of Onion Storage and Dryer. This will give solution to the households having problems in storing volume of onions to be used year rounds. This will ease the household to purchase early during harvest time when the onions are in lower price. The onion storage and dryer is capable of sensing temperature and moisture content of the area so that the microcontroller device will set the fan that served as cooling medium for the said storage and dryer.

This study aimed to develop and evaluate an Onion Storage and Dryer that will sense the temperature and moisture content of the area. Specifically, it aimed to determine: 1. To design and construct onion storage and dryer. 2. To evaluate the onion storage and dryer thru design, portability and efficiency. 3. To test the efficiency of the device.

The input of the study was through the gathered feedbacks/comments. The feedback collected was utilized to create design in solving the current problem of the household members about storing of onions. The researcher prepares materials for construction and testing.

The process established by constructing the onion storage and dryer. Once completed, there was testing

done if certain conditions were satisfied with its functions. There were evaluations done by 30 household users in certain barangay in the Municipality of Miagao, Iloilo.

The output was the result of evaluation as to the acceptability level of the design. The efficiency was still on going because the device still needs to observed as to the yield result of onions year round if the onions stay long in the storage area without damage. This was also to observed certain conditions of the device as to sensing temperature and moisture content of the area.

2. METHODS

A developmental approach was utilized. A model determines requirements and parameters, design, prototype, testing and implementation, refinement and maintenance.

The constructed Onion Storage Dryer was subject to evaluation as to design, portability and efficiency. There was series of testing and renovations. Once the Onion Storage and dryer was completed, tested and implement, there will be still observation as to efficiency. Meantime, the design and portability issue was established. The efficiency will be observed year round so that the result as to efficiency will be reliable.

The researcher developed questionnaire and was validated. This was used to collect data for the level of acceptability as to design and portability. This was distributed using purposive sampling in a certain barangay in Miagao, Iloilo, Philippines

The researcher gathered questionnaires was compiled subject for computation of mean.

3. PROJECT DESIGN

The various embodiment of the storage and dryer relates to storing of onions to maintain the moisture contents and temperature needed. More particularly, the present invention is home essential that the households can store more onions to sustain year round of consumption. Capable of performing detection method for onion moisture control by means of microcontroller circuits sensing device such as moisture, temperature sensor, motor fan control and timer for fan rotation.

In the present specification the terms "moisture" or "humidity" may be used interchangeably, but preferably the former is applied to solid products and the latter to gases, particularly air.

In principle, the inventors of the present storage and dryer have observed a noticeable lack of offer in the market regarding facilities for onion storing, keeping normal condition with natural air and/or normal temperature. Also it is observed that the facilities currently available in the market are not especially suited for different climatic zones, especially designed for households for easy cleaning and access by users. They have also observed that there is still a need of process optimization, in order to obtain a more economically profitable process with normal operating temperatures compared to onion dryers currently available in the market.

Currently, available onion storage and dryer are handled and utilized by businessmen having commercials selling onions. Some portable is used to protect from winters which is not suitable in a tropical country. Majority of the onion growers and households does not store bulk of onions because they don't know how to store, in order to prolong the shelf life. Other methods like hanging, contain in a basket which in the long run the onions decays due to high moisture content.

Accordingly, there is a need for an onion storage and dryer to preserve onions to extend the stocks for a year round consumption. This is also to reduce moisture content and maintain the normal temperature for onions to stay long.

Embodiments of the design will now described with reference to the drawings summarized below. The embodiments of the design are illustrated by way of example shown below.

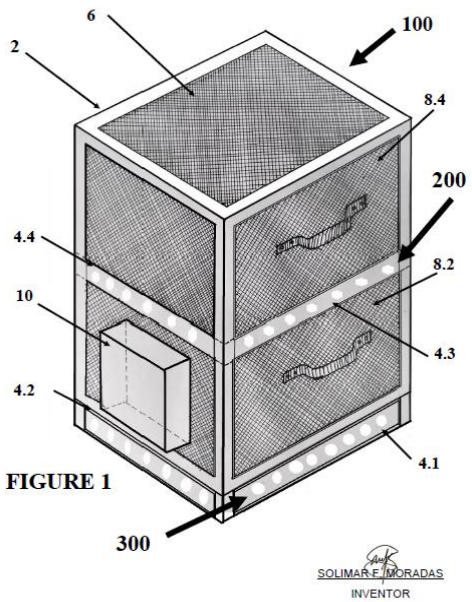

FIGURE 1

Figure 1, is the perspective view of the onion storage and dryer, 100. As shown in figure 1, with body reference 100, is the perspective view of the device comprising of a structured frame 2, a tiny hole's screens 6, numerous fans 4.2, 4.4, sliding trays 8.2, 8.4, a microcontroller circuit for moisture, temperature and fans controls 10, and a solar panel controller connected to battery 16.

Broadly speaking, a typical onion drying process starts with loading the onions into the sliding tray 8.2 and 8.4. Said onions loading is obtained by manually picking onions moved inside the sliding tray for storage. A numerous fan, cooling enhancers, temperature and moisture sensors, and other devices are generally connected to the lower portion of structured body frame in order to circulate an air flow through the onion bulbs in a more or less continuous way, wherein said air flow draws moisture from the evaporation of water around onion bulbs.

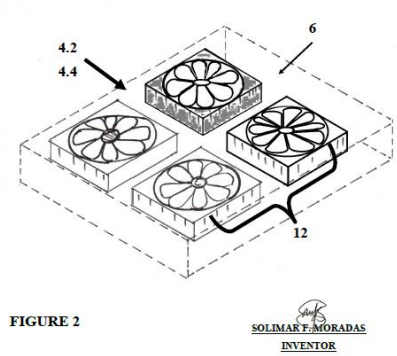

Figure 2, as shown with body reference 4.2 and 4.4, is the perspective view of the cooling fans comprising a dc low power fan 12 attached to base frame holder 4.1 and 4.3. The case body is made of aluminum 6, imaginary dissect to see the fans.

The numerous fans 12 are dependent to the sense temperature rating and moisture contents detected by the temperature and moisture sensors. Once the moisture content is high while temperature is normal, the numerous fans will activate. The timer will take place dependent to the content of moisture, the said timer will switch off the numerous fans completely when the moisture content is set in less or set to normal level.

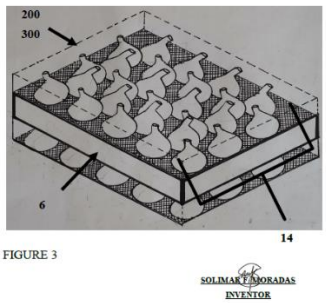

Figure 3, as shown in reference 200 and 300, is the perspective view of the cooling enhancer 14, attached to base frame holder 6.

The attached cooling enhancer 14, are the supplementary aide to compress air flow for cool effect while moisture is reducing to normal level. This an aide for rainy and summer season to make onions stay long.

4. RESULTS

The results of the developed prototype after completed, tested with certain functions to satisfy the needs as Onion Storage and Dryer focus on acceptability of the device as to design and portability. In the study of U. Priyanka [1], they were utilized solar tunnel dryer. The efficiency of the device will be added after one year of testing. This is to find out the yield result of onions bulb stored in this storage and dryer. Also, other studies focus on drying design for onion slices like the studies of Abdulahi Umar et. al. [2] and A.K. Rupnar [3]. Below were the results of the level of acceptability evaluation.

Table 1. Summary Results of Evaluation as to Design of Onion Storage and Dryer as Evaluated by Household members.

	Mean	Equivalent Rating
1. The design of the prototype is appropriate for Onion Storage and Dryer.	4.0	VA
2. The design creates positive impacts to our environment.	4.2	VA
3. The components/ parts of the prototype are properly arranged and proportioned.	4.4	VA
4. The prototype satisfy certain condition in sensing temperature and moisture content.	4.0	VA
5. The structure of the device can withstand wet and dry season.	4.0	VA
6. The prototype can be easy to use.	4.2	VA
7. The prototype provides safety to the user.	4.0	VA
8. The prototype energy source is versatile.	4.4	VA
9. The design shows novelty.	4.2	VA
10. The over - all design of the device is acceptable for prototype of Onion Storage and Dryer.	4.0	VA

Table 1 shows the results of evaluation as to design of Onion Storage and Dryer as evaluated by household members. The design parameters included in the evaluations gives Very Acceptable description. This imply that the Onion Storage and Dryer was very acceptable to the household members. The appropriateness, impact to environment, properly arranged and proportion, versatile, friendly to the user and satisfy the condition to normalize the temperature and moisture content in the area where it was place.

Other drying methods like the study of Ayalew Demissew et. al. [4], focus on nutritional value and volatile components of red onions. In there study implementing sliced onions to ready for ingredients for the purpose.

Table 2. Summary Results of Evaluation as to Portability of Onion Storage and Dryer as Evaluated by Household members.

	Mean	Equivalent Rating

1. The Onion Storage and dryer prototype provided with accessories, provision casing for easy to handle and transport.	4.2	VA
2. The Onion Storage and dryer can adapt operational hardware environment.	4.2	VA
3. The Onion Storage and dryer circuit and controls can easily replace and install.	4.4	VA
4. The overall structure can withstand with rugged use.	4.2	VA
5. The onion Storage and Dryer is user friendly.	4.2	VA

Table 2 shows the results of evaluation as to Portability of Onion Storage and Dryer as evaluated by the household members. The Onion Storage and Dryer evaluated Very Acceptable. This imply that the provision as storage and dryer in households satisfy the needs of the user. The storage and dryer can store 15 to 20 kilograms of onion bulbs. This was the average volume of onion bulbs that every households needs in a year round. The Prototype constructed ideally to store this capacity. The structure has the provision of handles, easy to transfer, clean and the controls were easy to operate and observed.

5. DISCUSSION

The design and constructed Onion Storage and Dryer was completed and tested. The prototype design outcomes satisfy the solution to a problem such as sensing the temperature value, and moisture content of the storage and dryer. The condition was, when the temperature level was high the fan will activate ON until the temperature returns to stable temperature of the onion storage and Dryer. Another condition was when the moisture content was high the fan will activate ON until the moisture content returns normal level. Either or both condition meet, the fan will activate ON, and when return to normal level, the fan will activate OFF. The embodiment of the device was employed fine metal net to protect onion bulbs from insect invader. This was to protect onions from insects laying eggs that later grown as larvae that will make the onions rotten. Drying was one of the method to make the onion stable and consume randomly up to the last onions incurred until next harvest comes according to H.H. Ghetany [5]. Some other sources can be compared to different medium of heating methods and strategy [6]. Some other models can also be satisfied the household consumers but there way of literacy was also limited in terms of preserving more onions [7]. The study of Djaeni [8] regarding drying rate using air dehumidication with silica was another method of drying medium. This drying method utilized in sliced onions ready for ingredients. Rekha et. al. [9] gives assurance that flowing air was one of the medium utilized to let the onion dry. Their studies effect of different curing methods also implies that the characteristic of onion bulbs really to maintain the dryness in order to stay longer without much affecting the nutrient content needed by the consumer.

The evaluation result of the evaluators as to the acceptability of the design rated Very Acceptable. This implies that the device was suitable onion storage and dryer for households used. Using a modified solar greenhouse dryer might require community to used. Green house dryer is suitable for bulk volume of onion bulbs. Perhaps good for farmer harvesting large volume. Extending it to the household users may also helpful [10]. That is why community planting onions may consider establishing this greenhouse to accommodate drying of onions after harvest.

The evaluation result of the evaluators as to the portability of the Onion Storage and Dryer rated Very Acceptable. This implies that the device was adaptable, easy to assemble, maintain and operate. Even the energy source was adaptable to on grid and off grid power source.

The study of Babagana et al. [11] gives certainty about the design and construction of dryer was verified. Although the dryer utilized for various vegetables, it attributes to the contribution of the fact that vegetables having similar characteristics in terms of drying. Only they differ as to how the vegetables be used in cooking method of the cook. The construction relied efficiency that yield good outcome.

The gas fired hybrid dryer of Anum et al. [12] constitutes excellent drying behavior and performance. They utilized conventional drying method that used to be low cost and effective. This study support farmers and merchants to store vegetables stay longer.

In other ways, A review of the indirect solar dryer with sensible heat storage can be utilized by controlling normal temperature setting among vegetables needed to be dried [13]. Effectivity of this technology can be applied in large volume and for commercial value. Meanwhile, the researcher wish to convey this theory, but not feasible to utilized by the household users. Furtheremore, the study of BK Pooja [20] enhance effect of different pre – heating chemicals on physico-chemical qualities of onion dried maybe varied according to the purpose onions. Maybe applicable for making onion flavored chips and the likes. In addition, varieties of onions differ in drying characteristics, giving ample nutrients needed by consumers [14]. The strategy of hot drying applied in cold countries. Unlike in tropical

countries, may applied another method of drying suitable for area and habitant.

6. CONCLUSIONS

The completed Onion Storage and Dryer satisfy the needs of the household users. The constructed onion storage and dryer was capable of maintaining the dryness of onion bulbs to protect for rotten. The storage and Dryer was responsive to the condition especially during handling of onions during cooking activities, temperature of the area, moisture content of the area. Circuits and controls were in safe place pleasant to the users. What implies was protecting onion bulbs from rotting and will longer store so that the household members who used to cook everyday will be having no problem in damaging their stored onions. Consistently modeling of drying process varies in different countries, [15]. Depends to the applicability of the onions. It takes several procedures if use in medical applications, natural beauty enhancer, therapeutic claims also needs more studies and testing. For food used as condiments usually common purpose was to make only the onions usual. Thus maintaining dryness and humidity was usually practiced.

The Onion Storage and Dryer can be utilized in areas attributing the same temperature and moisture content condition. Especially the dry and wet seasons. The Onion storage and dryer operate in varied conditions depends on the temperature and moisture content of the location areas.

7. IMPLICATIONS

Based on the preceding conclusions, the following recommendations were made: After observing the efficiency of the Onion Storage and Dyer, the researcher plan to submit design for fabrication laboratory of the institution for replication. It is customary to observed progress. For small scale drying, solar collector integrated HGSD under natural convection are better as they give faster drying with less investment [16]. Adoptable to the needs of the consumer can also be sustain, after the test of efficiency results being analyzed.

The Onion Storage and Dryer will extend the promotion to the business sector especially to restaurants, cafeterias, food pubs and other like to help maintain and support proper storing of onions. Likewise, other technology may adopt to enhance yield crops [17]. Primarily with this study, consumers can value savings by purchasing volume of onion bulbs to store with in a year for family consumption.

The researchers were open for further comments to improve device to be more capable of implementing in other sectors, other areas wherein adapting the temperature and moisture content varies. Such as different drying method may enhance conventionally or by combing other technologies suited to the needs of onions foodstuffs applications [18]. There is a need preparation and quality evaluation in order produce quality, economic and sustainable commodities like onions [19].

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