ANALYSIS OF THE PROCESS OF COMBINED DRYING OF TOMATO SEEDS

Qobilov H.X.
PhD, Bukhara engineering technological institute
Raxmonkulova X.O.
Master`s student, Bukhara engineering technological institute

ABSTRACT

Tomato seed is a good source of antioxidants because it is rich in phytochemical compounds. It is an important reservoir of phenolic compounds. There is growing recognition that many phenolic secondary metabolites present in seeds may be beneficial to human health to some degree, mediated via antioxidant actions. Every tomato seed contains a tiny tomato plant that is alive but dormant. This means that it is not growing, it is just waiting. When environmental conditions are right, the seed will germinate. This is when the tiny plant sprouts from the seed and begins to grow. Collect tomato seeds at the end of the season when the fruit is ripe and ready. Some gardeners simply cut open the tomato and squeeze the pulp onto a plate or other container. The pulp needs to dry and then you can separate out the seeds. Another method is to rinse off the pulp in a colander or screen. The process of how to save tomato seeds starts with a ripe, juicy tomato fresh off the vine. Collect tomato seeds at the end of the season when the fruit is ripe and ready.

Key words: *drying process, temperature, moisture, processing methods, structure tomato seeds.*

АННОТАЦИЯ

Семена томатов являются хорошим источником антиоксидантов, поскольку они богаты фитохимическими соединениями. Это важный резервуар фенольных соединений. Растет признание того, что многие фенольные вторичные метаболиты, присутствующие в семенах, могут быть в некоторой степени полезны для здоровья человека благодаря антиоксидантному действию. В каждом семени томата содержится крошечное растение томата, которое живо, но находится в состоянии покоя. Это значит, что он не растет, а просто ждет. При благоприятных условиях окружающей среды семя прорастет. Это когда крошечное растение прорастает из семени и начинает расти. Собирайте семена томатов в конце сезона, когда плоды созрели и готовы. Некоторые садоводы просто разрезают помидор и выдавливают мякоть на тарелку или другой контейнер. Мякоть должна высохнуть, а затем можно будет отделить семена. Другой метод — промыть мякоть на дуршлаге или сите. Процесс сохранения семян томатов

начинается со спелых, сочных помидоров, только что сорванных с лозы. Собирайте семена томатов в конце сезона, когда плоды созрели и готовы.

Ключевые слова: *процесс сушки, температура, влажность, способы обработки, строение семян томата.*

INTRODUCTION

Some gardeners simply cut open the tomato and squeeze the pulp onto a plate or other container. The pulp needs to dry and then you can separate out the seeds. Another method is to rinse off the pulp in a colander or screen. Still another method of saving seeds from tomatoes requires the pulp to be put in a glass jar filled with water. You can shake it and let it soak for five days. Skim off the foamy fermented pulp and the seeds will be at the bottom of the jar. The most important part of the process of harvesting tomato seeds is the drying. If the seeds aren’t properly dried, they will mold and then all your work will be fruitless. Spread the seed out on paper towels to absorb any moisture in a warm dry location. Store the seeds until spring in a clean glass jar with a tight-fitting lid. Seeds need to be stored where it is dark to prevent stimulating their photo-receptors, which tell them when it is time to germinate. They may lose vigor or fail to sprout if they are exposed to light.

Gently scrape the seeds into labeled paper envelopes. Store them in a dry place at a cool, steady temperature. You could store envelopes in a tin or other sealed container, together with silica gel crystals to keep the air dry. Seeds can store for up to five years. Bright light is super-important for healthy tomato seedlings! As soon as they sprout, they'll reach up for sunbeams (or fluorescent beams). Seedlings need 12-18 hours of light each day. Growing tomatoes from seed can be challenging. But once one knows how, it isn't that difficult. Many benefits come with growing tomatoes from seed. All one needs are some basic supplies and a bit of know-how to get tomato seedlings off to a good start.

Figure1.Structure of tomato seeds

The present study aimed at investigating the use of a drying system combining the concept of low-pressure superheated steam drying and heat pump drying for fish. The effects of various drying medium pressures on the temperature field, airflow field, drying time, equipment performance as well as the power consumption of the drying process were investigated and discussed. Four comparative tests with different initial pressures were carried out according to a specified drying process by the combined drying system. The results showed that when the vacuum was high, the temperature field and airflow field in the drying chamber were more uniform. Due to the poor heat transfer performance of the drying medium at high vacuum, the drying time increased with a decrease in initial pressure. It was also found that with the decrease in drying medium pressure, the power consumption of the heat pump and the axial fans was reduced, while the power consumption of the electric heater went up. Overall, the total power consumption is directly proportional to the drying medium pressure. The drying process is used in the food industry to increase the shelf-life of food products without adding preservatives. In this study, using a combination of osmotic dehydration (OD), convective, and microwave-vacuum drying technologies, carrot snacks were prepared using four colored carrot varieties (purple, orange, yellow, and white carrots), three fruit concentrates (apple, chokeberry, and sour cherry), and sucrose solution (control group). The results showed that the OD process increased the polyphenolic content of the dried carrot samples; however, their carotenoid content decreased due to heating processes, and α-cryptoxanthin was the only carotenoid found in all carrot snacks. In addition, yellow carrot dehydrated in the sour cherry solution exhibited the highest total polyphenolic content (TPC), with the highest acetylcholinesterase and butyryl cholinesterase enzyme inhibition activities. In general, the use of the chokeberry solution resulted in high antioxidant activities and, in the case of orange carrot, the highest α-glucosidase and pancreatic lipase activities. Furthermore, sensorial acceptance of carrot snacks changed with product characteristics. The purple carrot-apple juice snack was evaluated as the best-colored product, and the orange carrot-sour cherry snack was evaluated as the best-smelling product. Finally, the obtained products were found to be attractive snacks with pro-health properties. This study aimed to prepare dried carrot snacks using OD, convective drying, and vacuum microwave drying, in which fruit juices were used to increase the l-ascorbic acid and bioactive contents of colored carrot varieties and enhance their pro-health properties. The water activities, color characteristics, and l-ascorbic acid, polyphenolic and carotenoid contents of the dried carrot materials were analyzed. In addition, antioxidant activities, α-amylase, α-glucosidase, lipase, acetylcholinesterase, and butyrylcholinesterase inhibition activities, and sensorial

acceptance of the products were evaluated. This study is the first to evaluate the physicochemical, bioactive compounds, biological activities and sensorial acceptances of dried colored carrot food products.

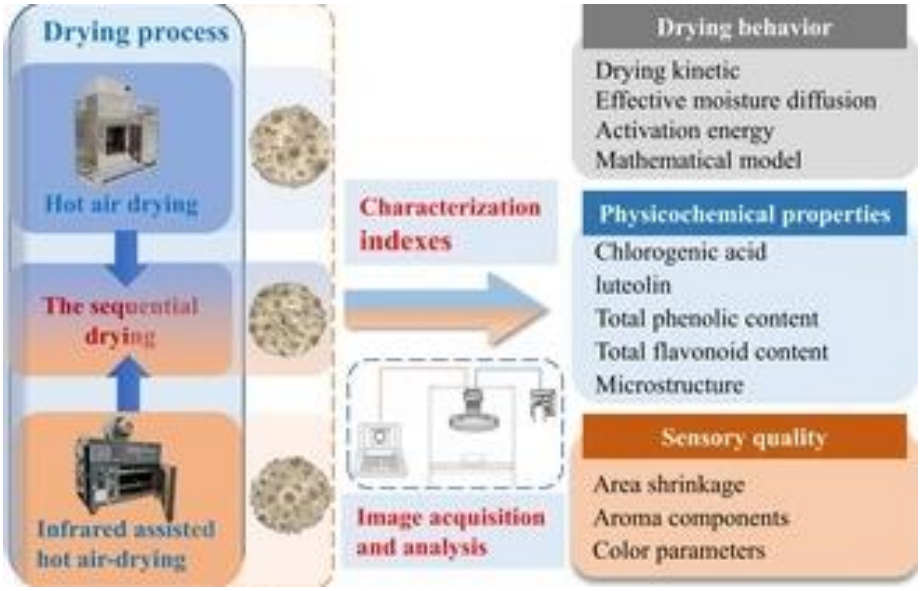
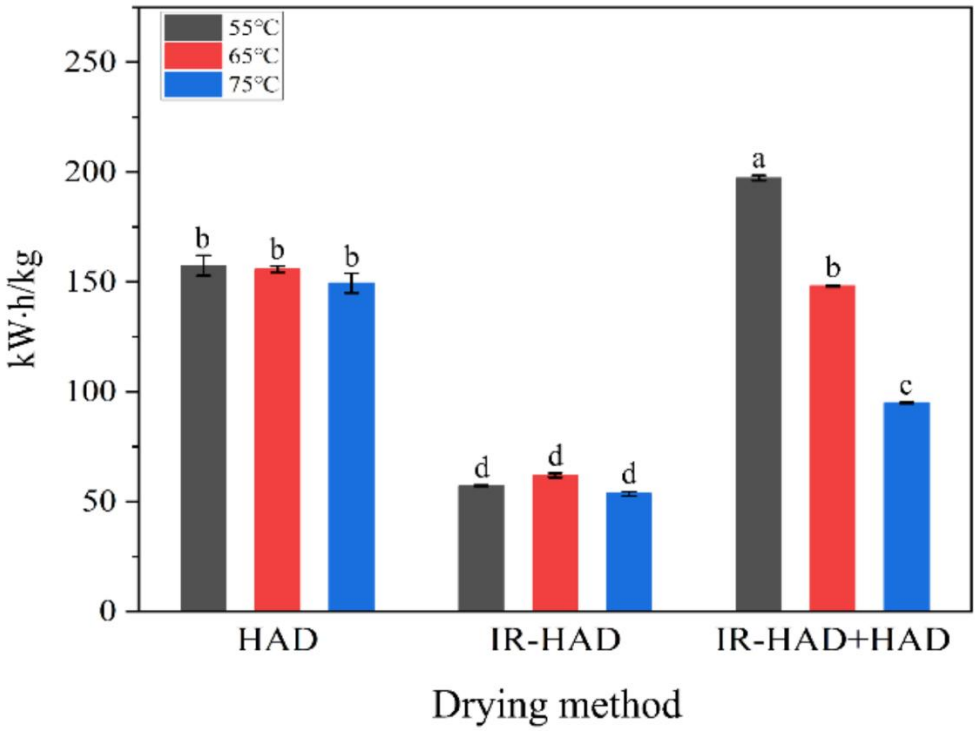


Figure 2. Processing methods of tomato seeds

Hot air drying (HAD) is widely used in industrial production owing to its simple equipment and broad applicability [5]. However, prolonged exposure to aerobic environment and high temperatures may result in the loss of bioactive and volatile ingredients [6]. Additionally, undesired changes in the appearance of chrysanthemum may occur, such as browning and curling of petals. Freeze-drying (FD) offers advantages in terms of improving the bioactive composition and physical structure the product [7]. Unfortunately, it was not economically realistic to dry seasonal herbs such as chrysanthemum due to high energy consumption and investment. Infrared (IR) heating is an emerging technology for rapid drying of thin-layered biomaterials. Previous studies have shown that the levels of total phenols and total flavonoids in IR-dried chrysanthemums were significantly ($p < 0.05$) higher than in shade-dried ones [8]. However, the radiation energy decays gradually as the penetration depth increases, which limits the effectiveness of IR in deep bed drying [9].

The average SEC values for different drying strategies of dried chrysanthemum cakes at different temperatures are shown in Figure 5. In terms of the effect of drying method on the SEC values, IR-HAD resulted in the lowest SEC values, regardless of drying temperature, which is related to the shorter drying time required for IR-HAD. Indeed, the correlation analysis showed a positive correlation between SEC values and drying time ($r = 0.98$), implying the reduction in drying time played a decisive role in reducing energy consumption. Notably, IR-HAD + HAD consumed much less

energy than HAD at 65 and 75 °C, which may be related to the improved heating uniformity of the chrysanthemum cake surface by IR radiation and the removal of a large amount of moisture from the interior of the chrysanthemum cakes during the first drying stage (IR-HAD). As for the effect of drying temperature on SEC values, it can be found that SEC values show an overall decreasing trend with increasing drying temperature. Regardless of the drying method, the lowest SEC values were obtained when drying temperature was 75 °C. However, the SEC values of IR-HAD at 65 °C was higher than that at 55 °C. This was most likely because the energy consumed to heat the air was higher than the energy saved by reducing the drying time. Similar results were also reported by Wang et al. [47].



As products of the esterification reaction, esters constitute an essential component of the volatile compounds of chrysanthemum samples. Five ester compounds (trans-chrysanthenyl acetate, bornyl acetate, methyl caprate, benzyl pentanoate and benzyl isovalerate) were detected in the dried samples, they emitted floral, fruity and sweet aromas. There was a noticeable difference in the retention level of esters, and IR-HAD yielded higher ester compound content than the other two strategies. Similarly, all aldehydes detected exhibited higher accumulation levels in IR-HAD samples than in the other two drying strategies.

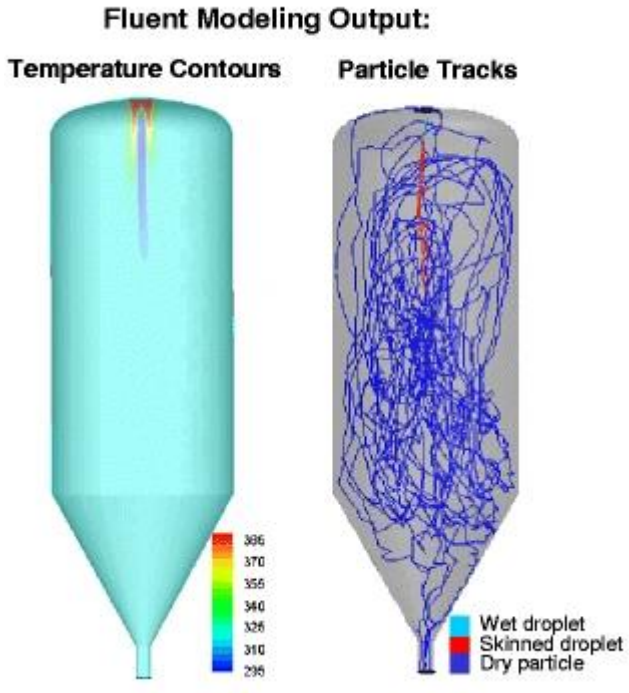


Figure 3. Example CFD simulation output for a specified set of process parameters

Benzaldehyde and 3-hydroxybenzaldehyde were the most abundant aldehyde compounds in the samples. Furfural and 4-iPr-benzaldehyde were absent in the freeze-dried samples, presumably they may have been formed during thermal processing. The aroma profile of chrysanthemum cakes is in a complex and dynamic state during drying. The evaporation and degradation of heat-sensitive volatile compounds in samples caused by heating are not the only determinants of their content changes underwent different drying conditions, and the dynamic chemical transformation among different volatile compounds in samples is also crucial. Overall, although different drying strategies promoted the generation of some volatile compounds, the total content of volatile compounds in dried chrysanthemum cakes showed a considerable reduction compared to freeze-dried samples. This phenomenon may be because the decomposition of the heat-sensitive components caused by high temperature generated during drying. Tomato seedlings emerge fast and show vigorous growth under warm, bright conditions, so there is little point in starting seeds very early. Tomatoes are the first veggie many gardeners grow from seed, mostly in pursuit of interesting varieties that are rarely available as seedlings. While there is little research on the maximum number of tomatoes you can eat in a day. Scientists say ideally one serving of tomatoes comprises either one whole regular tomato or six cherry tomatoes. So enjoy your tomatoes but spread out your intake throughout the week. Most laboratory-scale spray dryers operate in a single-

pass mode where the drying gas is passed through the chamber only one time before it is vented to the appropriate waste stream. Many large pilot-scale and production-scale spray dryers operate in closed-loop or recycle mode where the solvent-laden drying gas is passed through a condenser, reheated, and introduced back into the drying chamber.

REFERENCES

1. Engelmann, N.J.; Clinton, S.K.; Erdman, J.W., Jr. Nutritional Aspects of Phytoene and Phytofluene, Carotenoid Precursors to Lycopene. Adv. Nutr. Int. Rev. J. 2011, 2, 51–61
2. Meléndez-Martínez, A.J.; Mapelli-Brahm, P.; Stinco, C.M. The colourless carotenoids phytoene and phytofluene: From dietary
3. sources to their usefulness for the functional foods and nutricosmetics industries. J. Food Compos. Anal. 2018, 67, 91–103
4. Khayrullo Djuraev, Mamura Yodgorova, Akhtam Usmonov, Mukhammad Mizomov Experimental study of the extraction process of coniferous plants, IOP Conference Series: Earth and Environmental Science
5. OR Abduraxmonov, OK Soliyeva, MS Mizomov, MR Adizova Factors influencing the drying process of fruits and vegetables ACADEMICIA:" An international Multidisciplinary Research Journal
6. Mizomov, M. S. (2022). Analyzing Moisture at the Drying Process of Spice Plants. *Texas Journal of Agriculture and Biological Sciences*, *4*, 84-88.