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The Effect of Storage period and Conditions on the Qualitative and microbial characteristics of sesame tolerant to seeds loss

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ABSTRACT

Sesame (Sesamum indicum L.) is one of the most ancient and valuable oilseed crops, ranking second in nutritional value after olive oil. After harvest, sesame seeds are typically stored for several months. Storage conditions significantly affect the quantity and quality of the extracted oil as well as the seed quality. Therefore, determining optimal storage conditions to preserve the qualitative characteristics of sesame oil and seeds is crucial for reducing post-harvest losses. In this study, sesame tolerant to seeds loss samples were stored under two environments (ambient conditions and refrigerated conditions) using three packaging types (unpackaged, cloth bags, and layer paper bags) for twelve months. Every three months, samples were evaluated for acidity, peroxide value, aflatoxin levels, and seed germination percentage using a factorial experiment in a completely randomized design. The results showed that the effects of storage environment, packaging type, storage duration, and their interactions on the evaluated traits were significant ($P < 0.05$). While the quality of oil and seeds declined over time, mean comparisons indicated that this decline was not significant ($P > 0.05$) for up to nine months in refrigerated conditions with paper bags, six months with cloth bags, and three months without packaging. The germination percentage of sesame seeds in cold storage was also significantly higher in all packaging materials and in both storage environments in paper bags throughout the storage period. The results indicated that the optimal storage conditions for sesame seeds, with minimal changes in the qualitative and microbial characteristics, were achieved over nine months in cold conditions using layer paper bags for packaging.

1-Introduction

Sesame is an oilseed due to its high oil content (40 to50 Percentage) And its compatibility with the climatic conditions of most parts of the country can be very effective in supplying oil and reducing the country's dependence on oil imports..Sesame In terms of nutritional valueIt ranks second after olive oil andA good source of beneficial fats, protein, and vitamins B, minerals, fiber and antioxidants.Sesame seeds are not only an excellent source of copper and manganese, but also a good source of calcium, magnesium, iron, phosphorus, zinc, molybdenum, selenium.and vitamin EIt is also [1]. Some studies have shown that taking sesame oil orally can treat shortness of breath, intestinal obstruction, seizures, and eye inflammation, and also improve antioxidant levels in patients with high blood pressure and diabetes.[2]. Sesame meal is also high in protein, rich in the amino acids methionine, calcium, phosphorus, and niacin, and is also used in animal feed.[3]. InIn common sesame varieties, the capsules containing the seeds open after ripening and the seeds are released during harvest, increasing harvest waste.. Recently, new sesame varieties have been developed, called "drop-resistant" varieties.Sesame indicum L.)) It is being developed to enable mechanized harvesting of sesame.[4]. IranWith production56 One thousand tons of sesame per year ranks sixteenth in the world. Developing a fall-resistant sesame can increase sesame production from56Current thousand tons62 Increase by a thousand tons[5].

Soma and colleagues (2013)They reported frequent temperature fluctuations, The amount of moisture and the length of storage time pose problems for the quality of sesame oil and storage. High moisture content of the seed, together with high storage temperature, accelerates the natural degradation process of biological systems, under which lipid oxidation and an increase in free fatty acids occur. On the other hand, increased cellular respiration under these conditions causes a decrease in carbohydrates, and as a result, the seeds quickly lose their vigor and then Their capacity for germination is severely reduced.[6]. Tida-New et al (2021) They investigated the effects of sesame storage conditions. They showed that the use of woven polypropylene bags in ambient conditions for up to 60 days and in cold environments for up to 180 days preserved the quality characteristics of oil and seeds.[7]. Olusundi et al.(2018) They stated that sesame seeds, due to their high oil and unsaturated fatty acids content, are beneficial after physiological maturity. Or Harvest from the farm They spoil quickly.. They are evaluating Qualitative characteristics of sesame seed and seed oil In different environmental conditions and cold storage for a period of time18 Storage month They showed that the effects of time, storage temperature, and packaging material have a significant effect on seed characteristics and the quality of extracted sesame oil.[8]. Vijaya Gitaand Baskerans(2020) They showed that seed drying plays a key role in maintaining oil quality during storage and stated that exposure of seeds to high temperatures leads to cracking of the seed coat, which leads to increased acidity, growth of various molds and production of mycotoxins, and poor germination.[9]. ThereforeReviewing post-harvest processes Especially suitable conditions for storing seeds for oil extraction or seed use It can help prevent and reduce quantitative and qualitative losses of seeds and oil after harvest. This research aims to determine the appropriate conditions and storage life of sesame while maintaining the qualitative characteristics of the oil and seeds.

2-Materials and methods

The sesame sample under study was the Ultan variety (resistant to falling) which was cultivated with appropriate agronomic management at the Gorgan Research Station and harvested after the seeds were ripe. The

drying operation was carried out using a cabinet dryer. (Manufactured by Letron Company، China) Done until moisture content is 7-8%.. ThenThe samples were stored at both ambient temperature (the usual traditional method) and refrigerated temperature (approx.5 Celsius), in three forms(Without packaging, Packaging in cloth bags and laminated paper bags) For a period of time(0، 3، 6، 9 and12 Moon) They were kept..It should be noted that the paper bag was three-layered (outer layer of thick paper + middle layer of polymer + inner layer of soft kraft paper). The following qualitative and microbial characteristics were evaluated during storage.

-Measurement of the percentage of free fatty acids: 5 Take a gram of oil sample and add it to about50 Milliliter of alcohol-neutralized solvent- Chloroform was added to it and titrated against phenolphthalein with 0.1 N potassium hydroxide solution (Figure 6).[10].

-Peroxide index measurement: Peroxide index based on the Shantaudker method, (1994) was calculated according to the following equation: [11].

(1) $$P.V = \frac{A_s - A_b \times m}{111.68 \times W}$$

m : Slope obtained from the iron concentration calibration curveIII Against absorption read:

A_s : Sample absorption at wavelength500 Nanometer,A_b : A witness was attracted.IN : Oil sample weight

-Determination of aflatoxin levels: Aflatoxin index level of samples It was determined by high-performance liquid chromatography and purification with an immunoaffinity column, and its amount was reported in micrograms per kilogram.[12].

-Standard germination test: To perform this test3 repetition50A handful of sesame seeds The seeds were wrapped in two pieces of paper towels and covered with another piece of paper..Then inside the incubator at a temperature25DegreeCelsiusIt was placed for 7 days and the numberGerminated seedsMeasured[13].

Statistical analysis: The resulting data were statistically analyzed using a three-factor factorial method in a completely randomized design (with three treatments of storage environment at two levels, packaging type at three levels, and storage time at five levels) with thirty treatments and three replications. Analysis of variance and comparison of means using softwareSASThe average main and interaction effects were examined using Duncan's multiple range test at the 5% level.

3-Results and Discussion

Interaction of the effect of seed storage conditions and duration on the acidity of sesame oil:

Statistical analysis of the results showed that the effects of environmental factors, storage time, and packaging type, and their interaction effects, were significant.(0/05>P)**.**Table1 The interaction effect of storage environment conditions, packaging type, and seed storage time on the acidity percentage of sesame oil is shown by the average acidity of the oil from65/0 Up to96/3Percentage and changed during storage.

Table 1- Percentage of acidity of sesame seeds over time and under different storage conditions

Storage time	Storage conditions					
	without packaging		Cloth bag		Paper bag	
	ambient	Cold storage	ambient	Cold storage	ambient	Cold storage
Zero time	0.66±0.04^{a}	0.65±0.04^{a}	0.65±0.04^{a}	0.65±0.04^{a}	0.65±0.04^{a}	0.65±0.04^{a}
Three months	1.21±0.04^{cd}	0.72±0.02^{a}	1.05±0.05^{cd}	0.7±0.02^{a}	0.9±0.02^{bc}	0.67±0.06^{a}
Six months	2.23±0.03^{h}	1.2±0.03^{cd}	1.9±0.06f^{g}	0.85±0.02^{ab}	1.53±0.06^{and}	0.75±0.03^{a}
Nine months	3.54±0.05^{j}	1.75±0.02^{if}	2.92±0.03^{i}	1.25±0.06^{d}	2.41±0.05^{h}	0.79±0.05^{a}
Twelve months	3.96±0.04^{k}	2.05±0.04^{g}	3.42±0.02^{j}	1.65±0.02^{g}	3.16±0.03^{i}	1.1±0.07^{bc}

* Unlike letters indicate significant differences at the 5% level.

The results of the statistical analysis of the interaction effect of all three factors, type of packaging, environment and storage time, indicated that the changes in acidity were less in cold storage conditions and in paper bags at all storage times. In cold conditions, sesame could be stored in paper bags for up to nine months, in cloth bags for up to six months, and in bulk without packaging for up to three months without significant changes in acidity.(0/05<P)(It should be noted that the standard acidity of raw sesame oil is acceptable up to 2 percent.) In the study of the storage environment factor, the comparison of the averages showed that the acidity in sesame storage in cold conditions is significantly lower than that in ambient conditions, and the average acidity changes in paper bags are significantly lower than in cloth bags and without packaging. Also, in the study of the storage time factor, the results showed that the acidity increased with increasing storage time.. The increase in acidity was the same in cloth bags and without packaging, and in storage for six to twelve months, this increase was significantly less in cloth bags than in unpackaged bags.(0/05>P)Kumar et al. (2016) showed that factors such as mechanical damage, temperature and humidity conditions, seed moisture, and delay in harvesting can increase oil acidity, among which moisture along with heat are the most important factors.The presence of polyunsaturated fatty acids linoleic acid and linolenic acid makes sesame oil susceptible to oxidation, and acidity increases with increasing storage time and storage temperature under ambient conditions. [14].

Humidity fluctuations in cloth bags are greater than in paper bags and they are more permeable to air.. Due to the permeability of the bag to moisture and oxygen in the air, free fatty acids have increased further. Free fatty acids, due to their hydrophilic and hydrophobic parts and reduced surface tension, increase the entry of oxygen into the oil, resulting in accelerated oxidation during shelf life and increased acid number. The increase in free fatty acids can also be attributed to the activity of the lipase enzyme. The hydrophilic nature of oilseed proteins, increased moisture absorption, and high oil content accelerate deterioration through increased activity of hydrolyzing enzymes resulting from increased cellular respiration and increased free fatty acids.The results of this study were a good proof of this.[15].

Interaction of the effect of seed storage conditions and duration on the peroxide content of sesame oil:

The interaction of the effect of storage environment, packaging type, and seed storage time on the peroxide content of sesame seed oil is shown in Table 2..The average oil peroxide content of14/2 Up to15/30 Milliequivalents of oxygen per kilogram of oilChanged under different storage conditions.

Table 2- Percentage of peroxide of sesame seeds over time and under different storage conditions

Storage time	Storage conditions					
	without packaging		Cloth bag		Paper bag	
	ambient	Cold storage	ambient	Cold storage	ambient	Cold storage
Zero time	2.18±0.5^{a}	2.16±0.4^{a}	2.18±0.5^{a}	2.14±0.3^{a}	2.18±0.5^{a}	2.15±0.4^{a}
Three months	9.61±0.6^{and}	5.46±0.6^{c}	6.37±0.7^{d}	3.41±0.5^{b}	5.81±0.6^{d}	2.6±0.5^{a}
Six months	16.65±0.5^{j}	10.28±0.5^{f}	13.25±0.5^{h}	7.35±0.8^{d}	11.75±0.5^{g}	3.15±0.7^{ab}
Nine months	24.11±0.7^{l}	13.37±0.7^{h}	19.23±0.4^{k}	10.64±0.4^{f}	17.2±0.8^{j}	5.75±0.5^{c}
Twelve months	30.15±0.5^{n}	15.21±0.8^{i}	26.25±0.6^{m}	13.35±0.5^{h}	23.52±0.6^{l}	9.2±0.4^{and}

* Unlike letters indicate significant differences at the 5% level.

The results of the statistical analysis of the interaction effects of all three factors, type of packaging, environment, and storage time, indicated that peroxide changes were lower in cold storage conditions and in paper bags at all storage times.(0/05>P). Throughout the storage period, the increase in peroxide in paper bags was lower than in cloth and

without packaging, so that its changes from zero to twelve months of storage, regardless of the storage environment factor, in paper bags, these changes varied from 2.15 to 9.20, and in plastic bags, these changes varied from 2.14 to 13.35, and in packaging, from 2.16 to 15.21 milliequivalon grams per kilogram. Comparison of the averages of the effect of the type of packaging material on the changes in peroxide value indicated that the average changes in peroxide value were significantly lower in paper bags than in cloth bags and without packaging. Also, in examining the storage time factor, the results of the comparison of means test showed that the peroxide value increased significantly with increasing storage time.(0/05>P).

Since the standard peroxide value in sesame oil is 20 milliequivalens g/kg of oil, in cold storage conditions these changes, although statistically significant, are less than the standard. However, in ambient conditions in all three types of packaging during storage, the peroxide value exceeds 20 milliequivalens g/kg and the oil is out of standard.Oilseeds contain unsaturated fatty acids that are very susceptible to deterioration. Unsaturated fatty acids are very sensitive to oxidation and, upon oxidation, are converted into compounds such as peroxides, diols, ketohydrosides, and epoxides, which in turn increase the peroxide value during storage.[16].

The results of safflower seed storage in ambient conditions showed that the content of linoleic and linolenic acid in the oil decreased, which was due to high temperature and oil oxidation in safflower seeds. The increase in the accumulation of reactive oxygen species in the seeds due to the decrease in antioxidant activities causes an increase in lipid oxidation in safflower seeds, which is consistent with the results of our research.[17].

Kumari et al. (2011) used paper, cloth and vacuum packaging to store corn seeds and stated that seeds packed in materials that allow water vapor exchange with the environment are better able to absorb water under high relative humidity and the seeds rot and spoil easily. Their results showed that seeds stored in paper bags have less moisture exchange with the environment and perform better in maintaining grain moisture than cloth bags. However, after six months of storage, moisture retention is lower, which could be a reason for better grain preservation in paper bags, which also confirms the results of this study. [18].

Interaction of the effect of seed storage conditions and duration on aflatoxin levels in sesame:

Statistical analysis of the results showed that the effects of storage temperature, storage time, and packaging type and their interaction were significant.(05/0>P)**.**The interaction of the effect of storage conditions, packaging type, and storage time on the aflatoxin content of sesame seeds is shown in Table 3. The average aflatoxin content during storage under different conditions ranges from zero to 15.28 micrograms/kg..

Table 3- Percentage of aflatoxin of sesame seeds over time and under different storage conditions

Storage time	Storage conditions					
	without packaging		Cloth bag		Paper bag	
	ambient	Cold storage	ambient	Cold storage	ambient	Cold storage
Zero time	ND	ND	ND	ND	ND	ND
Three months	7.15±0.3^{and}	ND	5±0.4^{d}	ND	ND	ND
Six months	16.15±0.2^{h}	ND	13.15±0.4^{g}	ND	5.15±0.3^{d}	ND
Nine months	23.24±0.5^{k}	2.5±0.3^{b}	18.24±0.5^{i}	1.33±0.4^{a}	12.24±0.5^{f}	ND
Twelve months	28.15±0.4^{l}	5.74±0.3^{d}	22.15±0.6^{j}	3.58±0.3^{c}	16.15±0.4^{h}	2.1±0.2^{ab}

* Unlike letters indicate significant differences at the 5% level.

ND: Not Determinable

The results of the statistical analysis of the interaction effect of all three factors: packaging type, environment, and storage time showed that changes in aflatoxin were lower in cold storage conditions and in paper bags at all storage times. In cold conditions, sesame remained without significant and undetectable changes in paper bags for up to nine months and in cloth bags and without packaging for up to six months.(0/05<P). In the study of the storage environment factor without the factors of packaging material type and storage time, the results of the comparison of means test showed that the increase in total aflatoxin in sesame storage in cold conditions was significantly less than in ambient conditions. In the study of the packaging material type factor, the comparison of means indicated that the average of significant changes in aflatoxin in paper bags was less than in cloth bags and cloth bags were less than without packaging. Also, in the study of the storage time factor, the comparison of means showed that with increasing storage time, total aflatoxin increased significantly.

Fungal contamination in oilseeds is one of the most important quantitative and qualitative losses during storage. On the one hand, it reduces the nutritional value of the product and on the other hand, it produces mycotoxins that are dangerous to humans and animals. Currently, more than 300 types of mycotoxins have been identified, of which aflatoxins are more important. Mycotoxins, especially aflatoxins, are secreted as secondary metabolites from fungi. Mycotoxins cause various types of cancer, reduced immune system and physiological disorders in humans and animals, and they cause great damage annually.[19].

Given the climate of the humid regions of the country, Provides very suitable conditions for the growth of fungi It seems that if the appropriate conditions are not met Storage, contamination of seeds Oil can easily kill fungi and the toxins they produce. The presence of high oil content and rapid cellular respiration of sesame seeds in high-moisture seeds and improper storage temperatures leads to the growth of fungi and the production of the mycotoxin aflatoxin. In addition to the production of mycotoxins, fungal activity in stored seeds can cause other undesirable effects such as heating, grain discoloration, shriveling or damage, and reduced nutritional value and germination. The spread of fungal growth and mycotoxins also causes the deterioration of the quality of the seed oil. Storage temperature patterns, relative humidity, grain moisture content, and gas concentration levels are related to mold growth and mycotoxin accumulation in stored oilseeds in various ways. The use of appropriate packaging prevents moisture transfer, insect penetration, and mold, and reduces the activity and spread of fungi and the production of aflatoxin.[20].

At the beginning of storage, the aflatoxin levels of sesame seeds did not differ significantly among the different storage conditions and time zero. However, the levels detected at months 6, 9, and 12 were significantly different. Sesame seeds stored in the unpackaged and ambient conditions had the highest aflatoxin levels at month 12, followed by the bagged sample. In contrast, sesame seeds stored in paper bags had the lowest total aflatoxin levels, which is due to their low moisture exchange. Proper storage significantly reduced the increase in mycotoxins by maintaining storage conditions.

There is a positive and significant relationship between mycotoxin levels and changes in humidity and heat during storage. Increased temperature, relative humidity, and oxygen supply in grains stored without packaging can contribute to the spread of aflatoxin-producing fungi. Increased fungal growth and mycotoxin accumulation in environmental conditions lead to a rapid increase in aflatoxin levels in Sesame seeds stored under these conditions have been shown to have a significant effect on aflatoxin production during storage. In other words, thermal changes due to seed

respiration, temperature, humidity, and contamination of sesame seeds with fungal spores significantly affect aflatoxin production during storage.

Interaction of the effect of seed storage conditions and duration on sesame germination percentage:

Statistical analysis of the results showed that the effect of factors, storage conditions and packaging type and their interaction on the average germination percentage was significant.(0/05>P)**.**Table4 The interaction shows the effect of storage conditions, packaging type, and seed storage time on the germination percentage of sesame seeds.. Germination percentage Under different storage conditions during twelve months of storage from 6.79 to 1.59PercentageIt has changed.

Table 4- Percentage of germination of sesame seeds over time and under different storage conditions

Storage time	Storage conditions					
	without packaging		Cloth bag		Paper bag	
	ambient	Cold storage	ambient	Cold storage	ambient	Cold storage
Zero time	79.1±1.2^{a}	79.4±1.1^{a}	79.5±1^{a}	79.4±1.6^{a}	79.4±1.6^{a}	79.6±1.2^{a}
Three months	75.1±1.1^{cd}	79.1±1.2^{a}	77.1±1.6^{b}	79.1±1.5^{a}	78.9±1.2^{a}	79.4±1.3^{a}
Six months	68±1.6^{h}	76.5±1.5^{bc}	71±2.1^{if}	79±2.4^{a}	74.5±2.1^{d}	79.2±1^{a}
Nine months	61.1±1.4^{j}	72.1±2.3^{and}	64.1±1.4^{i}	75.1±1.6^{cd}	70.1±1.6^{g}	79.1±1.4^{a}
Twelve months	59.1±1.5^{k}	69.1±1.6^{g}	61.1±1.5^{j}	71.1±2.3^{if}	67.7±1.6^{h}	78±1.1^{b}

* Unlike letters indicate significant differences at the 5% level.

**It should be noted that the low overall germination percentage of the seeds at time zero (initial stage) in this study was due to the late-season rainfall in Golestan province during harvest, which coincided with the final physiological maturation stage of the seeds.

The results of the statistical analysis of the interaction effect of all three factors, type of packaging, environment and storage time in Table 5 indicated that the changes in germination were less in cold storage conditions and in paper bags at all storage times. In cold conditions, sesame was preserved in paper bags for up to nine months, in cloth bags for up to six months, and in bulk without packaging for up to three months without significant changes in germination index.(0/05<P)In the study of the storage environment factor without the factors of packaging material type and storage time, the comparison of the averages showedThe germination index has a decreasing trend during the storage period.However, the reduction in germination percentage when storing sesame in cold conditions is significantly less than when stored in ambient conditions.(It is worth notingThe low overall percentage of seed germination at time zero of this study was due to the interaction of the final period of physiological seed development with the late season rainfall in Golestan Province at the time of harvesting this variety. In examining the factor of packaging material type, comparison of the means indicated that the average reduction in germination percentage in paper bags was less than in cloth bags, and cloth was less than without packaging.

The results of the study of the storage time factor showed that the germination percentage decreased significantly with increasing storage time.(0/05>P)The results showed that the storage ability of sesame seeds in cold storage was better in all packaging materials during the storage period. Therefore, the importance of storage temperature was more important than the type of packaging in the germination index.Storage is a fundamental practice in controlling the physiological quality of seeds and is a method by which the viability of seeds can be maintained and their vigor maintained at a reasonable level during the time interval between sowing and harvesting. Seed deterioration begins immediately after the crop reaches physiological maturity. Therefore, to prevent quantitative and qualitative losses during

storage, appropriate conditions must be adopted. Uykal (2014) reported that seeds deteriorate during storage due to cell membrane damage and other structural changes in the seed structure system. Such changes lead to complete disruption of cell membranes and organelles, ultimately causing seed death and loss of seed viability. In other words, the most well-known and predictable ultrastructural changes in all cell organelles are the loss of membrane integrity, which consistently leads to increased seed deterioration, especially during storage.[21]. Research results showed that seeds stored in environmental conditions lose their viability and vigor very quickly due to changes in storage conditions, temperature and relative humidity. He stated that the storage capacity of seeds is also affected by the type of packaging material. [22].In addition, changes in temperature, humidity, and storage duration can also effectively affect the seed storage process, which our results clearly demonstrated. The environmental conditions of seed storage determine the length of time that germination and vigor are maintained. Seed deterioration during storage will reduce quality, seedling establishment, and ultimately plant performance in the field. Seeds with higher quality and vigor can germinate better and have a higher germination percentage and germination rate in the face of environmental stresses, ultimately producing stronger seedlings.[3].

Reactive oxygen species including hydrogen peroxide, superoxide radical, and hydroxyl radical are commonly involved in seed physiology. They are of interest as toxic molecules that reduce germination percentage.According to the results of the trend of changes in acidity and peroxide indices obtained in this study, the decrease in germination percentage can be attributed to the production of compounds resulting from the oxidation of sesame oil during storage, and it is observed that the results of their changes are also consistent with the germination index. Seed moisture content and the rate of oxygen exchange with the environment are important factors in lipid oxidation in sesame seeds, which leads to rapid deterioration of the seed and a decrease in its quality. Temperature is another important factor in sesame seed storage, as chemical changes and fungal growth and activity increase with increasing temperature.Their accumulation causes lipid peroxidation, damage to nucleic acids, destruction of cell membranes, and ultimately reduced germination.[23]. One way to preserve sesame seeds for a long time without using chemicals is to use packaging made of the appropriate material for storing seeds. The materials used for seed packaging must be able to prevent the seeds from deteriorating due to moisture and oxygen.[24].

The results showed that the germination percentage was significantly affected by the packaging materials. Seed storage materials significantly affect germination. The use of appropriate packaging materials for seed storage is necessary to prevent seed deterioration from factors such as moisture and oxygen. The germination percentage was observed to be lower in seeds packaged in cloth bags than in paper bags, because they are permeable to moisture and susceptible to changes in environmental conditions. In other words, moisture fluctuations in cloth bags are greater and more permeable to air, and similar results have also been reported.[25].

The results clearly showed that refrigerated storage was better than ambient temperature in terms of germination percentage. Under low temperature storage conditions, the metabolic activities of the seeds are maintained at a lower rate and deterioration is minimized. In other words, it can be said that temperature has a significant control on the quality maintenance of stored seeds, as it affects biological activities and controls the respiratory process of seeds and microorganisms, which was also clearly seen in the results of this study.

4- Conclusion

Sesame is more susceptible to loss of quality during storage due to its high oil content. Proper grain storage conditions as one of the post-harvest processes It can be an important economic step in preventing and reducing post-harvest sesame waste. In this study, it was determined that the optimal storage conditions for sesame seeds are resistant to shedding with minimal qualitative and microbial changes for nine months in cold conditions and packaged in laminated paper bags.

5-Resources

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ارزیابی تاثیر زمان و شرایط نگهداری بر ویژگی‌های کیفی و میکروبی دانه کنجد مقاوم به-ریزش

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چکیده

کنجد یکی از گیاهان دیرینه زراعی و با ارزش است که از نظر ارزش غذایی مقام دوم را پس از روغن زیتون به‌خود اختصاص داده‌است. دانه کنجد (Sesamum indicum L.) معمولاً پس از برداشت به مدت چند ماه در انبار نگهداری می‌شوند. شرایط نگهداری دانه بر کمیت وکیفیت روغن استحصالی دانه و کیفیت بذری کنجد تاثیر به‌سزایی دارد. بنابراین تعیین شرایط مناسب نگهداری و حفظ خصوصیات کیفی روغن و بذر کنجد، به جهت کاهش ضایعات پس از برداشت اهمیت دارد. لذا در این تحقیق نمونه‌هایی از کنجد مقاوم به‌ریزش در دو محیط (شرایط محیطی و شرایط سرد با دمای یخچال)، با سه نوع بسته‌بندی (بدون بسته‌بندی، کیسه پارچه‌ای متقالی و کیسه کاغذی لایه‌دار) به مدت دوازده ماه نگهداری شدند و در طی این مدت هر سه ماه یک‌بار نمونه برداری و اسیدیته و میزان پراکسید، درصد جوانه زنی و میزان آفلاتوکسین دانه و به روش فاکتوریل در قالب طرح کاملا تصادفی مورد ارزیابی قرارگرفتند. نتایج نشان داد اثر عامل‌های محیط، نوع بسته‌بندی و مدت زمان نگهداری و اثرات متقابل بین آنها بر خصوصیات مورد ارزیابی معنی‌دار است ($P<0/05$). با افزایش زمان نگهداری خصوصیات کیفی روغن کاهش یافت، اما آزمون مقایسه میانگین‌ها نشان داد این کاهش در شرایط نگهداری سرد (یخچال) و بسته‌بندی در کیسه کاغذی تا نه ماه، در کیسه پارچه‌ای تا شش ماه و بدون بسته‌بندی تا سه ماه معنی‌دار نبود ($P>0/05$). همچنین درصد جوانه زنی بذرکنجد در انبار سرد، در تمام مواد بسته بندی و در هر دو محیط نگهداری در کیسه کاغذی در طول دوره نگهداری به‌طور معنی‌داری بالاتر بود. نتایج حاکی از آن بود که بهینه شرایط نگهداری کنجد مقاوم به‌ریزش با کمینه تغییرات کیفی و میکروبی به مدت نه ماه در شرایط سرد و بسته بندی با کیسه کاغذی لایه‌دار است.