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# EFFECT OF BLACK SEED OIL AND *ALOE VERA* GEL ON BANANA FRUIT MATURITY AND QUALITY

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## Abstract

This study was conducted in the Care and Storage Laboratory-College of Agriculture-University of Baghdad to investigate the influence of *Aloe vera* gel and black seed oil on bananas fruits imported from the Philippines in the all green stage. This study included two levels of black seed oil, 2% ($T_2$), 4% ($T_3$) and three levels of *Aloe vera* gel, 25% ($T_4$), 50% ($T_5$), 100% ($T_6$) as well as control treatment ($T_1$). Treatments were replicated three times at RCBD design. The fruits were stored in refrigerators at 11±1°C and relative humidity (80-85%) until 12/11/2017. The results showed the lowest weight loss, fruit decay, fruit firmness, ascorbic acid content and fruit pectin content was observed in 4% black seed oil ($T_3$) at 4.357%, 8.333%, 9.667 kg/cm$^2$, 5.923 mg. 100 mg and 0.310%, respectively. Also the results showed that 50% *Aloe vera* gel ($T_5$) gave the highest fruit potassium content of 0.400%, 25% *Aloe vera* gel ($T_4$) gave the highest fruit starch content of 8.120% and 100% *Aloe vera* gel ($T_6$) treatment have the highest fruit chlorophyll content of 3.578%. while storage treatment did not affect on TSS, total sugar and fruit carotene content.

## Introduction

Banana (*Musa acuminata*) belongs to the family Musaceae is an economic and important fruit crop grown worldwide in more than 120 countries throughout tropical and subtropical regions (Zhang *et al*., 2005) as it has an excellent flavor and high nutritional value. In 2017, the acreage of banana in the world reached about 5637508 hectare, with production of 113918763 tons (FAO, 2017). The main producing countries are India then China, Indonesia, Ecuador, Brazil and Philippine (FAO, 2017). Banana is a Climacteric fruit, as it increases its susceptibility to damage over time after the harvest and the percentage of losses increases to 20-30% (Temi *et al.,* 2014). During ripening and marketing, quality and shelf life are limited by excessive fruit softening and rotting (Li, 2008). There is a massive transformation of starch to sugars (Gelencsér *et al*., 2008). To move away from chemicals to improve the qualities of fruit quality has become an urgent need so the use of plant extracts as an alternative, so the researchers sought to think about finding ways to conserve fruits by reducing damage and prolonging their shelf life, taking into account public health and environmental protection. Recent studies have shown that *Aloe vera* gel has proven effective against many fruit and vegetable diseases caused by fungi (Jasso de Rodriguez *et al.,* 2005). *Aloe vera* is a tropical and subtropical plant that has been used for centuries for its medicinal and therapeutic properties (Eshun *et al*., 2004). The two major liquid sources of *Aloe vera* area yellow latex (exudates) and a clear gel (mucilage), which proceeds from the large leaf parenchymatic cells (Ni *et al*., 2004). *Aloe vera* based edible coatings have been shown to prevent loss of moisture and firmness, control respiration rate and development and maturation, delay oxidative browning and reduce microorganism proliferation in fruits (Kumar and Bhatnagar, 2014). The *Aloe vera* gel is known to contains, as many as 75 known ingredients. Leaf of Aloe is a treasure house of vitamins, minerals, enzymes, amino acids, sterols and anthroquinones. The cathartic proportions of the Aloes are attributed to the presence of a mixture of glycosides called "Aloin" (Chandegara and Varshney, 2005). *Aloe vera* gel coatings have a various favorable effect on fruits such as imparting a glossy appearance and better color, retarding weight loss or prolonging storage/shelf-life by preventing microbial spoilage in mango fruit (Dang *et al*., 2008).

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Shelf life and quality of banana fruits were evaluated by physical (firmness, PLW), chemical (total soluble solids, titratable acidity, ascorbic acid, pH, total sugars, reducing sugar and non-reducing sugar) and sensory characteristics, such as color, taste flavour and over-all acceptability were analyzed at regular intervals during the storage period, Among the treatments, fruits coated with 6 percent *Aloe vera* gel and packed in 200 gauges LDPE bag significantly delayed the ripening process and exhibited slow changes in all the parameters tested. Shelf life could be extended up to 14 days and showed highest content of total soluble solids, ascorbic acid, total sugars, reducing sugar and non -reducing sugar (Abdul Aziz, 2011). Sridevi *et al*., (2017) found the pomegranate arils coated with sodium benzoate 400 ppm in combination with *Aloe vera* gel 30% and *Nigella sativa* oil 200 ppm recorded significantly lowest physiological loss in weight and spoilage of arils.

Black seed plant (*Nigella sativa*) is known throughout the world with different names such as Seed of blessing (habbat-ulbaraka), black seed oil is reported to be beneficial due to its content of over a hundred components such as aromatic oils, trace elements and vitamins (Ali and Blunden, 2003). Black cumin, used mainly for culinary and medicinal purposes was observed to possess anti-carcinogenic, anti-ulcer, anti-bacterial and anti-fungal activities. Several studies have been conducted to determine the role of black seed oil in fruit storage, Amin *et al*., (2015) studied effects of Arabic gum (15%), and Black cumin oil (1%) and lemon grass oil (0.5%) alone or in combination on fruit physical and chemical properties of Zaghloul fruits stored, results showed that after 60 days of cold storage, the weight loss and decay percentage of fruits treated with 10% Arabic gum + 1% black cumin oil + 0.5% lemon grass oil were lower than the control. Sridevi and Bhaskar (2018) experiment conducted on pomegranate fresh seeds (arils) to prevent quick moisture loss and browning of arils, applied different concentrations of black cumin seed oil and starch as a coating to improve the shelf life and quality of arils and results showed that pomegranate arils coated with *Nigella sativa* oil at 200 ppm concentration recorded significantly lowest total sugars content and titrable acidity. Due to the low presence of bananas in the market (3-5) days at temperatures not appropriate, so the purpose of the study is the use of natural plant extracts, namely *Aloe vera* and black seed oil as plant alternatives to prolong the marketing life of banana fruits and maintain quality.

**Table 1:** Effects of *Aloe vera* and black seed oil on physiological loss in weight, fruit decay, fruit firmness, total acidity and ascorbic acid of banana fruit.

| Treatments | Weight loss (%) | Decay (%) | Firmness (kg/cm$^2$) | TSS | Total Acidity (%) | Ascorbic aci (mg.100mg) |
|---|---|---|---|---|---|---|
| Control ($T_1$) | 5.123 | 28.33 | 6.667 | 16.67 | 3.770 | 5.137 |
| 2 % Black seed oil ($T_2$) | 5.430 | 36.67 | 2.667 | 15.00 | 3.873 | 5.587 |
| 4 % Bblack seed oil ($T_3$) | 4.357 | 8.333 | 9.667 | 15.57 | 4.166 | 5.923 |
| 25 % *Aloe vera* gel ($T_4$) | 6.083 | 23.33 | 9.500 | 16.67 | 3.846 | 5.240 |
| 50 % *Aloe vera* gel ($T_5$) | 4.690 | 18.33 | 8.833 | 17.50 | 3.856 | 5.480 |
| 100 % *Aloe vera* gel ($T_6$) | 7.802 | 51.67 | 6.633 | 18.30 | 3.960 | 5.497 |
| L.S.D 5% | 1.768 | 8.869 | 2.407 | N.S | 0.109 | 0.233 |

## Materials and Methods

This study was conducted in the Care and Storage Laboratory-College of Agriculture-University of Baghdad to investigate the influence of *Aloe vera* gel and black seed oil on bananas fruits imported from the Philippines in the all green stage. This study included two levels of black seed oil, 2% ($T_2$), 4% ($T_3$) and three levels of *Aloe vera* gel, 25% ($T_4$), 50% ($T_5$), 100% ($T_6$) as well as control treatment ($T_1$). Treatments were replicated three times at RCBD design. Banana hands were separated, washed in water and allowed to drain the water. After bunches were properly air dried, they were dipped in *Aloe vera* gel of different concentration, as mentioned in treatments details. The treatments were carried out on 24/10/2017. The fruits were stored in refrigerators at 11±1°C and relative humidity (80-85%) until 12/11/2017. The following parameters was determined:

1. **Weight loss percentage:** Date fruits were periodically weight and the losses were recorded for each replicate. Date of weight loss was calculated as percentage from the initial weight.
2. **Decay Percentage:** Percentage of fruit decay was calculated in relation to the initial weight of stored fruits. Rotted fruits removed and weighted.
3. **Firmness:** The firmness of the fruit at equatorial region was measured as, the force required for puncturing the fruits using a hand penetrometer. The firmness was calculated and expressed as kg/cm$^2$.
4. **Total soluble solids (TSS):** The TSS of banana juice was determined with the help of hand refractometer and expressed as degree Brix (ºB).
5. **Total Acidity:** Acidity of the fruit pulp was determined by titrating it with 0.1N Sodium Hydroxide (NaOH) as suggested by Ranganna (1977).
6. **Ascorbic acid (mg/100mg):** Ascorbic acid was determined by

**Table 2:** Effects of *Aloe vera* and black seed oil on total sugar and fruit potassium, pectin, starch, carotene and chlorophyll content of banana fruit.

| Treatments | Total Sugars (%) | Fruit Potassium content (%) | Fruit pectin content (%) | Fruit starch content (%) | Fruit carotene content (%) | Fruit chlorophyll content (%) |
|---|---|---|---|---|---|---|
| Control ($T_1$) | 5.167 | 0.383 | 0.253 | 8.110 | 0.116 | 3.572 |
| 2% black seed oil ($T_2$) | 5.097 | 0.360 | 0.250 | 8.100 | 0.120 | 3.478 |
| 4% black seed oil ($T_3$) | 5.040 | 0.383 | 0.310 | 7.966 | 0.119 | 3.413 |
| 25% *Aloe vera* gel ($T_4$) | 4.810 | 0.333 | 0.277 | 8.120 | 0.115 | 3.556 |
| 50% *Aloe vera* gel ($T_5$) | 4.863 | 0.400 | 0.253 | 8.050 | 0.115 | 3.430 |
| 100% *Aloe vera* gel ($T_6$) | 4.937 | 0.363 | 0.307 | 7.953 | 0.115 | 3.578 |
| L.S.D 5% | N.S | 0.041 | 0.023 | 0.077 | N.S | 0.187 |

2-6-dichlorophenol indophenol titration method as suggested by Ranganna (1977).

7. **Total Sugars (%):** Estimated in a Enon and Lane manneras received (A.O.A.C. 1970).
8. **Fruit Potassium content (%):** Estimated by Flame photometer.
9. **Fruit pectin content (%):** It may precipitate a method (Joslyn, 1970).
10. **Fruit starch content (%):** It may precipitate a method (Joslyn, 1970).
11. **Fruit carotene content (%):** Carotenoids were analyzed according to an already published method (Nagata and Yamashita, 1992).
12. **Fruit chlorophyll content (%):** was determined by method as suggested by Ranganna (1977).

The obtained results were subjected to analysis of variance according to (Elsahookie and Wuhaib, 1990) using L.S.D 0.05 for comparing differences between various treatment means.

## Results and Discussions

Effects of *Aloe vera* and black seed oil on physiological loss in weight, fruit decay, fruit firmness, total acidity and ascorbic acid of banana fruit: Significant differences were observed in the physiological loss in weight, fruit decay, fruit firmness, total acidity and ascorbic acid of banana fruit treated with different natural plant extracts (Table 1). Significantly lowest weight loss, fruit decay, fruit firmness and ascorbic acid content was observed in 4% black seed oil ($T_3$) at 4.357%, 8.333%, 9.667 kg/cm$^2$ and 5.923 mg.100mg, respectively. Lowest total acidity was 3.770% in control treatment. While experimental treatments did not affect the percentage of solids total soluble (TSS). Efficacy of black seed oil was previously reported by Kahramanoglu (2018) and Kahramanoglu *et al*., (2018) on pomegranate fruits.

Effects of *Aloe vera* and black seed oil on total sugar and fruit potassium, pectin, starch, carotene and chlorophyll content of banana fruit: Data concerning the effect of treatments on total sugar and fruit potassium, pectin, starch, carotene and chlorophyll content are listed in table 2. The data cleared that 50% *Aloe vera* gel ($T_5$) significantly increased and gave the highest fruit potassium content of 0.400%, 25% *Aloe vera* gel ($T_4$) gave the highest fruit starch content of 8.120%, while 4% black seed oil ($T_3$) gave the highest fruit pectin content of 0.310% and 100% *Aloe vera* gel ($T_6$) treatment have the highest fruit chlorophyll content of 3.578%, while storage treatment did not affect on total sugar and fruit carotene content. This may be due to the reason that, coating of *Aloe vera* gel delayed the degradation of chlorophyll and softening of fruit peel by maintaining high humidity in the vicinity of the fruits. *Aloe vera* gel may also cause inhibition of microbes, which reduced post harvest diseases in banana fruits. Similar results are in conformity with those of Martinez *et al*., (2006) on sweet cherry and Abdul Aziz (2011) in banana.

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