

Original Research Article

Efficacy of natural extracts on the storage quality of Apple

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A B S T R A C T

Keywords

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The aim of this research is to study the application of plant natural extracts for extending storage period of apple (*Malus domestica*). Apple surface were coated with 1%, 1.5%, 2% neem oil (*Azadirachta indica*), *aloe vera* and 10% 15%, 20% extracts of marigold flower (*Tagetes erectus*), analyzed for physiological and physiochemical such as loss in weight, fruit firmness, pH, TA, TPC, TSS and microbial analysis , which extensively increased in uncoated apples (control) over storage and flavor related factors such as total soluble solids (TSS), titratable acidity (TA) levels were observed maximum in treated Apples and sensory analyses of treated apples showed beneficial effects in terms of appearance and maintenance of the visual aspect of the apple without any detrimental effect on taste, aroma, or flavors. This work evaluated the use of neem oil , *Tagetes erectus* , *Aloe vera* as edible coating, which is an economical and eco-friendly. The results were analyzed on the basis that surface-coating of apple with natural stored in plastic air tight container at 15°C for 45 days.

Introduction

A growing awareness among consumers towards the health aspects has increased their interest in use of natural products, natural plant extracts (i.e. botanicals) can applied as natural preservatives. Various natural extracts or preservatives are observed every year as safe and efficient antimicrobials, antifungal, and antioxidants (Bhat et al., 2011). These natural preservatives are able to increase the nutritional value of the food, they preserve. Specially, the essential oils of many herbs, spices, fruits, and vegetables,

can be used all together as flavorants, nutritional supplements, and preservatives Abhay et al., 2011 and Tajkarimi et al., 2012). Apples are vital dietary sources of phenolic compounds and have strong antioxidant capacity as compared to other fruits (Sunet al., 2002). Use of apple polyphenols has reduced risk of coronary heart disease (Boyer, 2004). Higher amounts of polyphenols, in particular flavonol glycosides, are generally found in the skin of the fruit, compared to the pulp (Khanizadeh et al., 2008).

Materials and Methods

Fruit

Fresh healthy apple fruits were purchased from local market of Gwalior and transferred to laboratory in sterile air tight container and washed with distilled water to remove the dirt followed by air dried. all the samples of apple stored at 15⁰ C.

Preparation of coating solution

Treatment coating solutions included neem oil and extract of marigold flowers (*Tagetus erectus*) at different concentrations on the percentage weight basis. The marigold flower extract was prepared by drying of flowers under shade followed by grinding them to a powder by blender. Aqueous solution of marigold was prepared by soaking a known weight of the powdered material in an equal quantity of water and keeping it overnight. Guar gum (2%) was added to make a coating solution. The solutions of neem oil were prepared by proper mixing of oil with distilled water, emulsifying with guar gum on a percentage weight basis (2 ml oil per 100 ml of distilled water with 2% guar gum).

Preparation biodegradable edible coating (*Aloe vera* gel)

Matured leaves of *Aloe vera* plant were harvested from botanical garden of VRG college Morar (Gwalior) and washed with a mild chlorine solution of 25%. *Aloe vera* gel matrix was then separated from the outer cortex of leaf and this colorless hydroparenchyma was ground in a blender. The resulting mixture was filtered to remove the fibers. The liquid obtained constituted fresh *Aloe vera* gel. The gel

matrix was pasteurized at 70°C for 45min. For stabilized the gel was cooled immediately to an ambient temperature and ascorbic acid (1.9 - 2.0g L⁻¹), then added citric acid (4.5 - 4.6g L⁻¹) was added to maintain the pH at 4. The viscosity of the stabilized *Aloe vera* gel and its coating efficiency was improved by using 1% commercial gelling agent and was used as coating agent. It was later stored in brown Amber bottle to prevent oxidation of the gel.

Neem oil and Marigold extract treatment

Fruits were dipped in 0% , 1% , 5%, 10% *Aloe vera* gel 0% ,10%, 15% and 20% marigold flower extracts (*Tagetus erectus*) and 0%, 1% 1.5%, and 2% of neem oil (*Azadirachta india*) for 5 min. Fruits without treatment were used as the control. Then Fruits were placed in plastic air tight container at 15⁰C for 45 days

Apple quality assessment

After storage, daily observations were taken. For quality assessment following parameters are evaluated which include: sensory evaluation (appearance, browning, flavor, cracking, firmness and skin shrinkage) by a panel of 5 trained judges (Xu et al. 2007). The visual characteristics, including berry and rachis appearance, were scored in daylight. Fruit flavor was evaluated under red light in a taste room in order to avoid the interference of visual judgment. and microbiological evaluation.

Results and Discussion

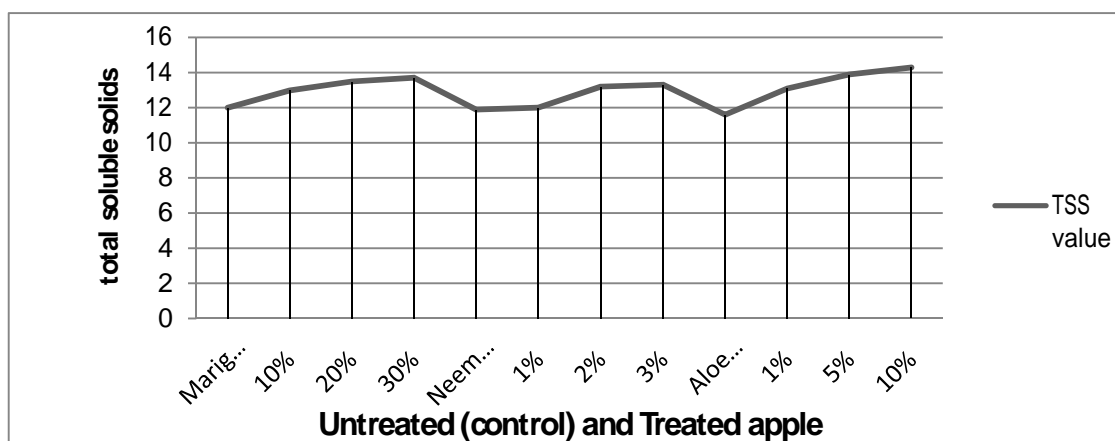
Table- 1: Apple samples were preserved for 45 days with edible coatings of

Table.1 Apple samples were preserved for 45 days with edible coatings of marigold oil, neem oil and Aloe vera

S. No	Treatment (Coating)	Storage (Month)	TSS	(TA) Acidity (%)	Weight (gm)		Total phenolic content
					On 0 day	On 45 th Day	
1	Marigold Extracts 0.0% (control) 10% 20% 30%	1.5	11.0	0.27	109.8	99.2	330
			13.0	0.29	107.3	101.3	380
			13.5	0.29	103.1	100.9	382
			13.0	0.31	108.9	106.9	385
2	Neem oil 0.0% 1.0% 2.0% 3.0%	1.5	11.9	0.28	90.9	80.0	300
			12.0	0.33	91.9	88.9	382
			13.2	0.32	92.9	89.3	382
			13.3	0.34	90.4	90.0	383
3	Aloe vera gel 0.0 % 1.0 % 5.0% 10.0%	1.5	11.6	0.26	90.9	81.0	300
			13.1	0.30	91.9	91.9	382
			13.9	0.30	99.9	99.3	385
			14.3	0.31	100.4	100.0	385

*Values of TSS, acidity and pH are average of 3 replicate treatments

Figure.1 TSS (Total soluble solids) value of apples



Graph.2 TPC of uncoated and coated Apple sample

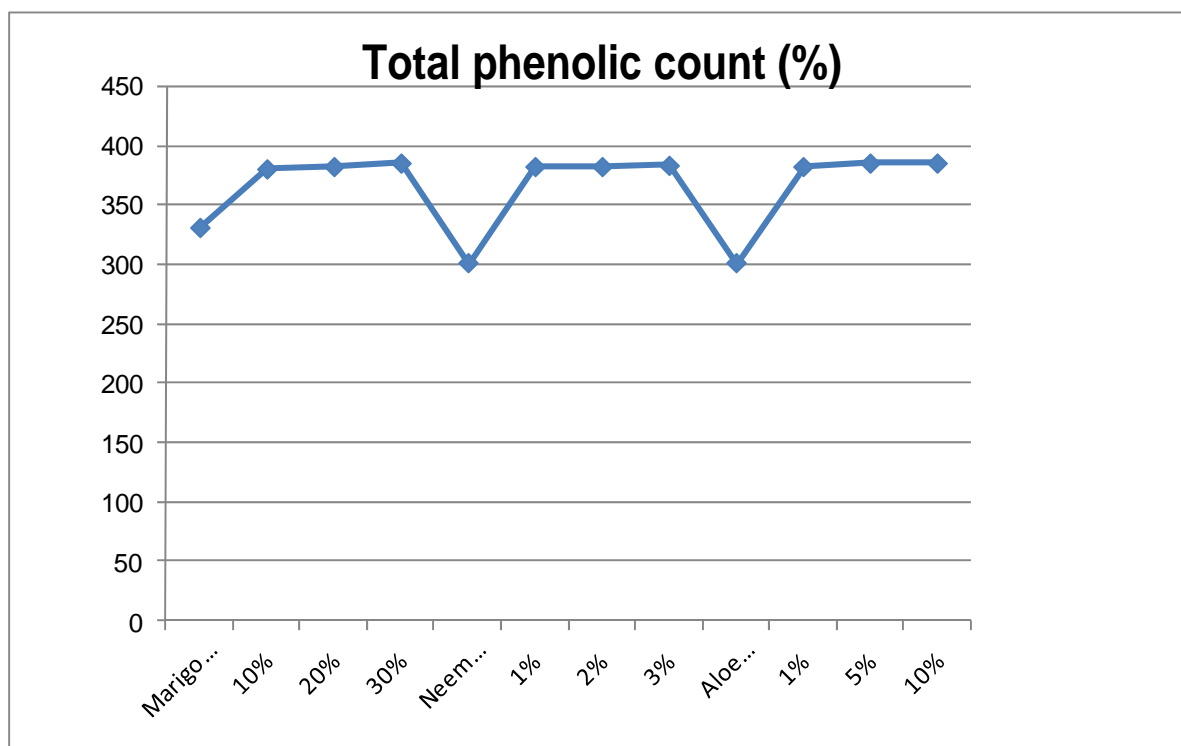


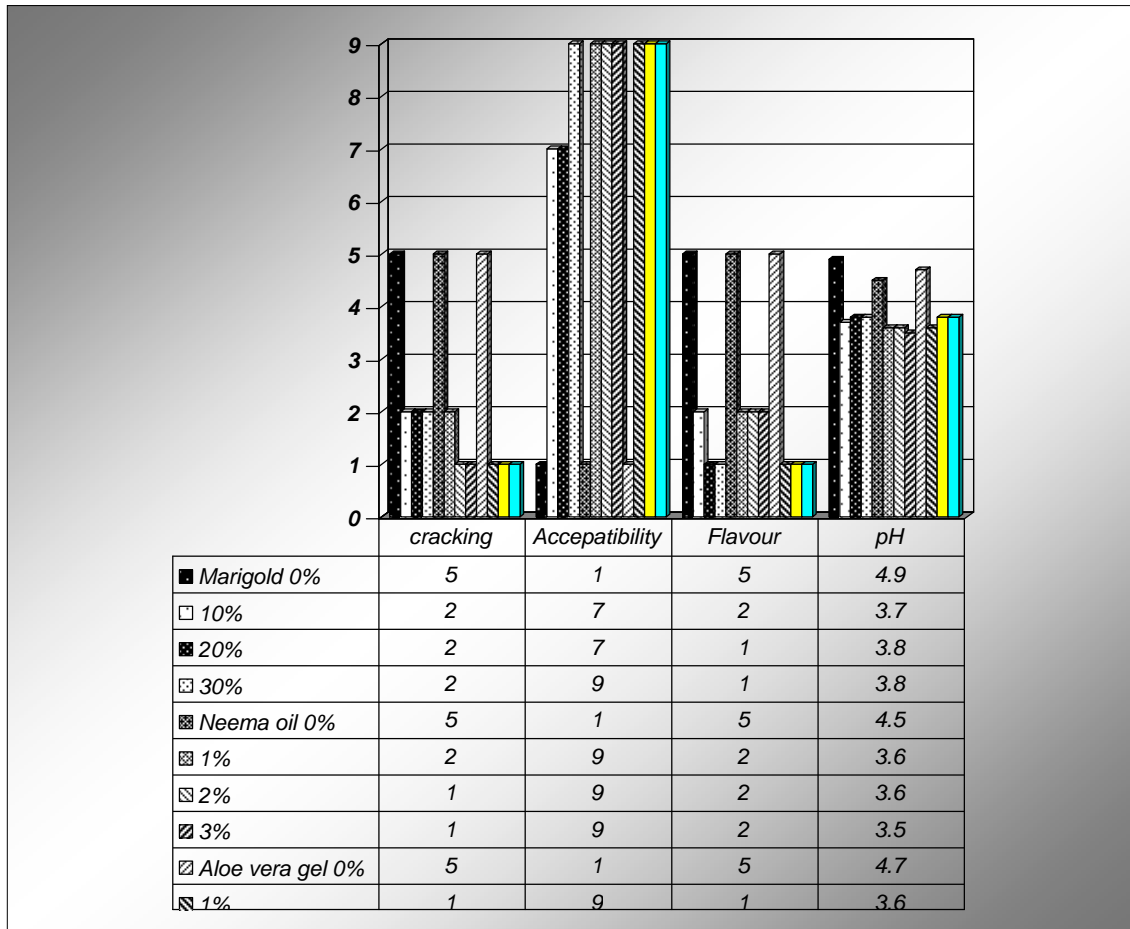
Table.2 Apple quality assessment (Visual scaling) for treated apple samples and untreated apple samples

S.No	Treatment	Visual index	
1	Marigold extracts	0.0% (control)	4
		10%	3
		20%	2
		30%	1
2	Neem oil	0.0% (control)	4
		1.0%	2
		2.0%	2
		3.0%	1
3	Aloe vera Gel	0.0% (control)	4
		1.0%	1
		5.0%	1
		10.0%	1

Visual index of apple:

1 = excellent, 2 = good, 3 = slightly dull, 4 = <50% brownish, 5 = >50% brownish.

Graph.3 Graph demonstrate coated or treated apple samples with higher score for visual aspects of degree of cracking level



marigold oil, neem oil and Aloe vera when stored at 15⁰C. Showing higher degree of weight loss in uncoated (0.0%) apple samples, the lower physiological weight loss of 3.0±0.4% was observed in coated apple samples, the results of this study revealed that coating of fruits with *Aloe vera* gel (10.0%) had the minimum physiological weight loss 0.4%. A slow decline in titratable acidity (Table 1) was observed with the storage period in all treatments. The 1% , 2% and 3% neem oil treatment retained the highest TA content (0.34%) with the minimum fruit juice pH (3.7), whereas 10% and 20% marigold oil recorded the lowest value of pH (3.6) with TA value , 0.29% The lower level of titratable acidity content and higher pH

was recorded in the control treatment . pH values are shown in graph -3.

Figure1. Indicates the maximum (14 %)total soluble solids (TSS) content recorded in response to coating with 10% Aloe vera and the minimum (12%)TSS content was recorded in the control treatment.TSS contents are mentioned in table -1.

Figure 2 indicates highest (385)total phenolic count with coated apple samples (30% marigold oil and 10% *Aloe vera* gel) and shows highest indication of TCP in treated samples , where as control or untreated samples show decline (300) in the value

Table 18 indicates quality assessment of treated and untreated apples with reference of visual scaling, uncoated (control) apples were found to be brown whereas coated (treated) apples were good in appearance. Excellent quality was observed with higher concentration of marigold, neem oil and *Aloe vera* gel treatments. Higher excellent appearance quality were found in *Aloe vera* gel treatment (1% , 5% and 10%).

Graph demonstrate coated or treated apple samples with higher score for visual aspects of degree of cracking level of apple skin , aroma or flavour , over all acceptability, *Aloe vera* gel coated samples shows excellent and higher scores among other treatments for all the assessments , where as control or untreated samples were observed with decline in score rate for assessments.

In conclusion, to our knowledge application of *A. vera* gel, neem oil and marigold flower extracts as edible coating in apple has not reported , These edible coatings has beneficial effects in retarding the ripening process and increasing TSS and TPC rate. This treatment was effective as a protective barrier and thus reduced the weight loss and lowered the decay rate during postharvest storage. The results of this paper show that *A. vera* gel, neem oil and marigold extracts could be applied for storage of apple fruit as these natural coatings inhibit microbial spoilage and reduce decay incidence during postharvest storage of apple.

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