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EFFECT OF EUGENOL EMULSION ON SHELF LIFE OF GRAPES AND STRAWBERRY

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ABSTRACT

In present study, eugenol (major functional component of essential oil of *Syzygium aromaticum* (clove), at 2% level (v/v) was incorporated in peanut oil based coating to get antimicrobial emulsion. Eugenol emulsion thus prepared was applied on grapes and strawberries. After applying emulsion, reference fruits were kept in corrugated fiber boxes for 8 days for shelf life studies under ambient conditions (temperature 24-27°C; Relative Humidity 55±5%). Fruit samples were checked for their visible microbiological growth every day and sensory evaluation of the coated samples was done up to the day of initiation of visible microbial growth. Results revealed that eugenol emulsions did not produced desirable effect on the shelf life of grapes and strawberries.

INTRODUCTION: Harvested fruits are good hosts of microorganisms because of their high moisture content and rich nutrients. Moreover, improper handling and storage damage the soft skin of fruits, thereby, making them susceptible to microbial onslaught and subsequent spoilage. Current economic and biological assessment upon withdrawal of most of the conventional synthetic antimicrobials registered for control of post harvest spoilage of agricultural commodities have elicited widespread interest in providing new perspectives for the development and commercialization of future antimicrobials particularly of biological origin, those are socially more acceptable and ecofriendly [1]. Spices need fewer introductions and for people throughout the world, they stimulate the appetite, add flavor and texture to food and create visual appeals in meals. Mainstream scientific community readily accepts spices as antimicrobial, antioxidant, anticarcinogenic, antihelmentic, anti inflammatory, insecticidal and nematicidal agents [2].

The incorporation of spices/spice based compounds into edible film coatings may provide a novel means of improving the safety and shelf life of fruits and vegetables.

Present piece of work involves application of eugenol (functional component of clove essential oil) incorporated in a coating emulsion for the preservation of grapes and strawberry.

MATERIALS AND METHODS:

Materials: Bright red coloured strawberries (*Fragaria×annanasa var. swiss Charlie)* and pale yellow coloured grapes (*Vitis vinifera var. early muscat)* were procured from local vegetable market (sabji mandi), Hisar, India. Procured fruits were medium sized, mature, fresh, firm, sound and were practically free from blemishes and injuries. Pea nut oil was purchased from confectionary shop, local market, Hisar. Glycerol monostearate and Tween-20 and eugenol were procured from Central Drug House, Bombay.

Methods:

Preparation of Coating Emulsions and their application on fruits: Hydrophobic peanut oil coatings (emulsions) were selected for incorporating eugenol Two peanut oil coating emulsions were made : one with eugenol (coat A) and the other without eugenol (coat B). Coat B served as control. Compositions and method for the preparation of coatings are as under:

Coat A:

- Peanut oil : 5.0%
- Glycerol monostearate (emulsifier) : 10.0%
- Tween-20 (wetting agent) : 1.0%,
- Eugenol : 2.0%

Coat B:

- Peanut oil : 5.0%

(Control)

- Glycerol monostearate (emulsifier) : 10.0%
- Tween-20 (wetting agent) : 1.0%,

Normal tap water heated to 90°C was used as a solvent for the preparation of coatings. All the materials were homozenized in a blender for 30 seconds. Before coating the fruits, both coating formulations were cooled down to ambient temperatures.

Reference fruits were washed with distilled water to remove contaminants and were air dried for 30 min., before subsequent treatments. Method of application of coatings on fruit samples was brushing. After applying coatings, the commodities were air dried for 30 min. and were kept in corrugated fiber boxes under ambient conditions (temperature 24-27°C; Relative Humidity 55±5%) for 8 days for shelf life studies.

Microbiological and Sensory evaluation of Coated Fruit Samples: Fruit samples were checked for their visible microbiological growth every day and sensory evaluation of the coated samples was done up to the day of initiation of visible microbial growth.

Sensory evaluation was done by 5 semi trained panelists. At each sampling date, coated fruits and vegetables were removed from the storage chamber and were subjected for sensory evaluation. The coded samples were randomly presented to each panelist, 2 samples at a time, with a rest period in between presentations to minimize sensory fatigue. Sensory evaluation was conducted in an air ventilated room under white light (daylight equivalent). Color, flavor, turgidity, brightness and overall acceptability were scored on 9-point hedonic scale having from liked extremely (9), liked very much (8), liked moderately (7), liked slightly (6), neither like nor dislike (5), disliked slightly (4), disliked moderately (3), disliked very much (2) to dislike extremely (1). The results of these sensory scores are presented in terms of overall acceptability.

Experiments were conducted in triplicates and results are average of three values.

RESULTS AND DISCUSSION: Initiation of microbial growth was noticed on 2nd day of storage in all the coated (coat A and coat B (control)) grapes and strawberries and on 8th day of storage, coated fruit samples displayed heavy microbial growth. These *in vivo* results are quite contradictory to the *in vitro* results of antimicrobial potency of eugenol [3]. The apparent discrepancy in results may be attributed to the differences in the systems under study.

In an *in vitro* study, the contact between the microorganisms and the antimicrobial components is intimate, however, when the antimicrobial components are applied on the whole fruits and vegetables as a dynamic biological system, the microorganisms may be protected and the action of the antimicrobials may be retarded. It has been reported that a mass of microbes remained immediately below or adjacent to minute cracks of the spinach that had been washed with sodium hypochlorite [4, 5].

Moreover, if the essential oils diffuse into the lipid or protein phase of the food, these would be relatively less available to act on microorganisms present in the aqueous phase. Lower water content of the food as compared to the laboratory media may also hamper the progress of antimicrobial agents to the target site in the microbial cell. Furthermore, this may also be due to the limitation of diffusion of eugenol by the structure of matrix of edible film. Sensory scores (based in terms of overall acceptability) of fruit samples coated with Coat A (emulsion with eugenol)

were compared statistically with fruits samples coated with Coat B (control i.e. emulsion without eugenol) (**Table 1**). Data revealed that sensory scores of both the reference fruits coated with Coat A did not differ significantly from those coated with Coat B on 0 and 1st day of storage. Application of both the edible films adversely affected the metabolism of fruits and vegetables. Off odors were detected right on the 1st day in all the coated (coat A and coat B) fruits. On 2nd day of preservation discoloration, loss of weight and turgidity was noticed in all the coated samples.

TABLE 1: EFFECT OF EDIBLE COATING EMULSIONS ON THE SENSORY SCORES OF FRUITS

Fruits	Coatings	Overall acceptability			
		Days			
		0	1	2	3
Grapes	Coat A	4.0 ±0.10**	1.2±0.22**	NA	NA
	Coat B	3.5± 0.36	1.5±0.24	NA	NA
Strawberries	Coat A	4.7±0.10**	1.5±0.21**	NA	NA
	Coat B	4.2±0.14	1.7±0.40	NA	NA

The obtained data were arranged statistically by means of program for statistical analysis in which the equations of the hypothesis test, including standard deviation, T-statistics value and probabilities were used. p values≤0.05 were considered as significant (*) and p values >0.05 were considered as non- significant (**).

NA: Not applicable; Coat A: Emulsion with eugenol; Coat B: Emulsion without eugenol (control)

CONCLUSION: It is concluded that the efficacy of antimicrobial edible coatings depends on the type of microorganisms, their attachment mechanisms and physical characteristics of fruits. The results suggest that the matrix of peanut oil emulsion did not pair well with the fruit samples as well as with eugenol and all the components behaved antagonistically.

Hence, an advance technology and an extensive and elaborated study is must regarding the selection of components for the formulation of stable edible films which can encapsulate the antimicrobial components and release them slowly after their application on food commodities.

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