# Antioxidant Effect of Betel Leaf Extract on Dry-Cured Fish

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The effect of betel leaf *(Piper betle Linn.)* extract on control of autoxidation of fat in dry fish has been studied. Oil sardine has been selected for experiments since it contains very high amount of fat. The treatments were given with 5% (w/v) betel leaf extract in water at different stages of salt curing. FFA, PV and TVN values of the samples were determined periodically to assess the keeping quality and autoxidation. The sample, prepared by dipping the fish in the extract immediately after salting and then drying as usual, was found to have better keeping qualities.

The use of chemical antioxidants in salt curing of fatty fish is widely practised at present. Valsan (1963) used butylated hydroxy anisole (BHA) in dry curing of fish along with sodium propionate. Sen & Sripathy (1967) recommended a preservative mixture containing BHA to retard brown discolouration and to minimise rancid odours in salt curing of mackerel. Kandoran *et al.* (1969) got encouraging results with BHA, butylated hydroxy toluene (BHT) and nordehydro guaretic acid (NDGA) in storing of laminated Bombay duck. Tanikawa (1971) describes the use of BHA and BHT in Japan to prevent oxidative rancidity of salt-cured fatty fish.

At present, there is a move the world over to restrict the use of chemicals in food stuffs. This paper reports the attempt to substitute chemical antioxidants by the extract of betel leaves which are available throughout India at very low cost. The leaves and roots of this plant have been widely used in various medicinal preparations of the Ayurvedic system of medicine. Revankar & Sen (1978) have reported that powdered betel leaf and its extracts in petroleum ether, benzene and ethyl alcohol could prevent rancidity of sardine oil during storage. But reference is lacking regarding the use of betal leaf extract as an antioxidant in the salt curing of fatty fish. This paper reports the attempts of such a study.

## Materials and Methods

Fresh oil sardine *(Sardinella longiceps)* procured from the nearby landing centre at Vellayil were used in the studies. Fresh betel leaves were purchased locally. The leaves were washed thoroughly and then extracted with water (in the ratio 5 g leaves in 100 ml water) using a waring blender, filtered through mulsin cloth and kept in glass containers. The fish were dressed in the usual way and treated as given below. Periodical analysis was conducted to follow the course of spoilage. Estimation of moisture, chloride, fat, FFA and PV were carried out according to AOAC (1980). TVN was estimated by the method of Conway (1947) on a trichloroacetic acid extract of fish muscle.

The experimental samples were prepared as follows:

1. Dressed fish, salted and dried in the sun, to serve as control.
2. Dressed fish was first dipped in the extract (1 litre for 1 kg fish), drained, salted and dried.
3. Salted, removed from self-brine, dipped in the extract, drained and dried.
4. Salted, partially dried, dipped in the extract and again dried.
5. Salted, dried, dipped in the extract and again dried.

Salting ratio – 1:5, Salting time - 24 h; Concentration of extract - 5% (w/v); Dipping time - 15 min.

**Results and Discussion**

Initial studies carried out to determine the suitable concentration of betel leaf extract for the experiments showed that good results regarding colour, odour and texture of the resulting product could be obtained when the fish was dipped in extract of 5% concentration for 15 min. Beyond this either one or all of the above characteristics of the fish was seriously affected (Table 1). Therefore, in subsequent experiments betel leaf extract of 5% concentration and a dipping time of 15 min were employed.

Changes in PV and FFA of the samples during storage are represented Figs. 1 & 2. In all the samples, moisture and chloride varied within a limited range. The untreated sample easily turned brown and discoloured. It lost the characteristic taste and developed off odour after storage for a period of two weeks. Sample 2 could be kept in good condition for eight weeks, while sample 3 remained good for twelve weeks. In sample 2, dipping was followed by salting and the salt solution has forced out most of the extract from the muscle tissues resulting in the shorter shelf life of the product in comparison with sample 3, which was salted

**Table 1.** *Effect of variation in concentration and dipping time of betel leaf extract on dry-cured sardine*

| Concentration of the extract w/v % | Dipping time, min | Organoleptic qualities of the finished product immediately after preparation | | |
|---|---|---|---|---|
| | | Colour | Odour | Texture |
| 5 | 10 | Good | Good | Firm |
| ,, | 15 | Good | Good | Firm |
| ,, | 20 | Fair-pale green | Slight betel leaf odour | Firm |
| ,, | 30 | Below average (More green) | Slight betel leaf odour | Slightly soft |
| 10 | 5 | Good | Good | Firm |
| ,, | 10 | Fair slight greenish tinge | Slight betel leaf odour | Firm |
| ,, | 15 | More green | More betel leaf odour | Firm |
| ,, | 20 | Greenish colour increased | Pronounced betel leaf odour | Slightly tough |
| 15 | 5 | Fair-Pale green | Slight betel leaf odour | Firm |
| ,, | 10 | More green | More betel leaf odour | Slightly tough |
| ,, | 15 | Pronounced greenish colour | Pungent betel leaf odour | Tough |

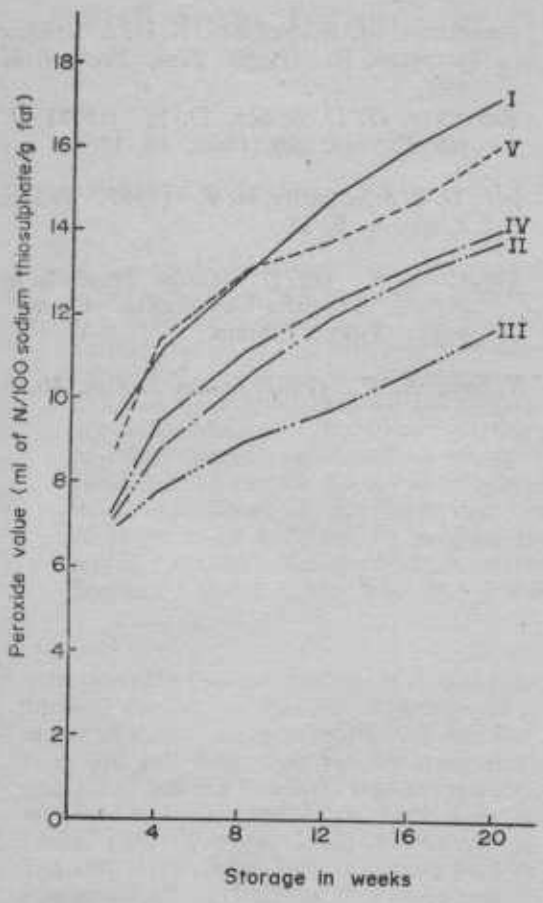


Fig. 1. Changes in peroxide value during storage

first and then dipped in the extract so that there was an effective absorption of the extract. Although there was a slight depletion of the salt content, sample 3 remained in good condition for about twelve weeks. Samples 4 and 5 were of poor storage life since the drying process did not facilitate proper penetration of the extract into the fish muscle.

It is important to note (Fig. 3) that an addition to the antioxidant property, betel leaf extract was able to check bacterial spoilage also to a certain extent. There was a gradual increase in the TVN values in the case of control, while samples 2 and 3 showed very slight increase. Here also, samples 4 and 5 were of poor quality because of the same reason as above.

Thus it is concluded that betel leaf extract is a good substitute for chemical antioxidants.

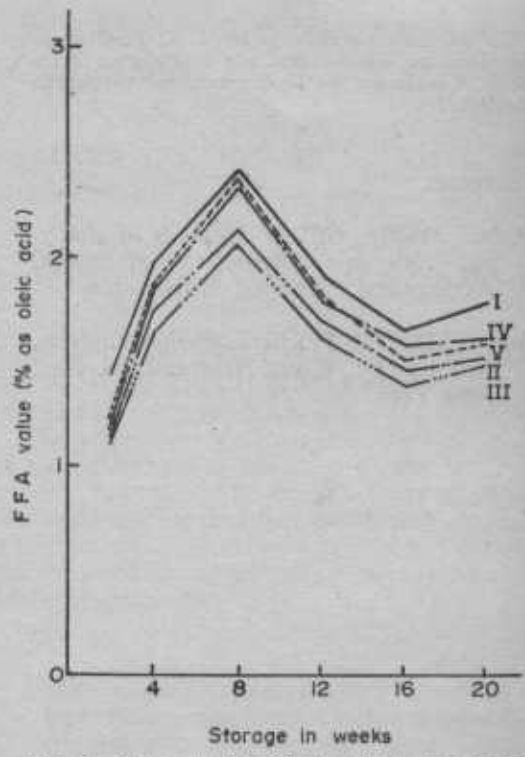


Fig. 2. Changes in free fatty acid during storage

Added to this, is its bactericidal property which increases its value as an indigenous cheap preservative.

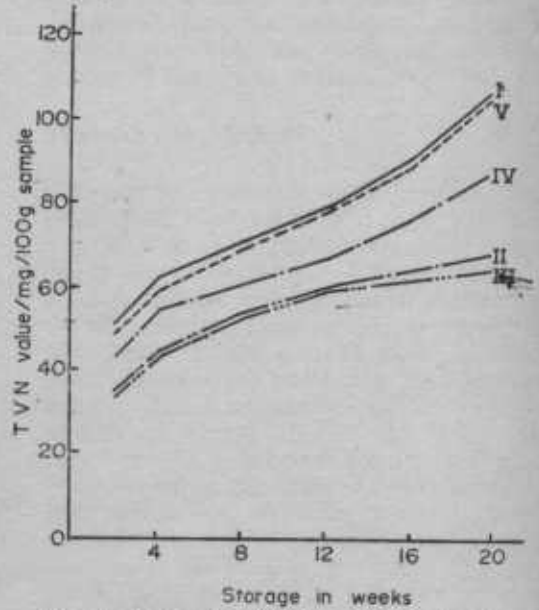


Fig. 3. Changes in TVN values during storage

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