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CHANGES IN THE QUANTITY AND QUALITY OF COCONUT OIL DUE TO MICROBIAL INFECTION OF COPRA

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Copra, the dried endosperm of coconut is subject to deterioration during processing and storage. Varghese (1952) reported that the quality of coconut oil depended on the quality of copra from which it was extracted. Improperly dried, mouldy material or copra obtained from immature nuts yield rancid and cloudy oil with a bitter taste and odour. Ward and Diener (1961) reported several biochemical changes in stored peanuts due to fungal infection. An attempt was made to study the quantitative and qualitative changes of coconut oil due to infection of copra by fungi and bacteria, which are commonly associated with its spoilage.

Materials and Methods

Coconut halves were made into pieces, sterilized using 1 per cent mercuric chloride solution and converted into copra by drying in a hot air oven for 6-8 hours at 70°C. The moisture content of copra was adjusted to 6 per cent and inoculated with different fungi and bacteria. The fungi included *Aspergillus niger, A. flaws, A. ustus, Rhizopus* sp., *Pencillium* sp., *Diplodia natalensis, Trichoderma viride, Cunninghamella verticiitata,* and *Syncephalastrum racemosum.* Among the bacteia, only *Bacillus subtilis* was used as this was the common bacteria observed.

The various fungi and bacteria were inoculated singly as well as in combination. They were kept in desiccators maintained at 80 per cent relative humidity and incubated for 30 days. The oil content was determined at the end of 15 and 30 days using the cold percolation method of Kartha and Sethi (1957). The variations in the colour and odour of oil was made visually.

Results and Discussion

The data on the reduction in oil content of copra consequent on inoculation with different fungi and bacteria singly as well as in combination are presented in Table 1. A progressive reduction in oil content was noticed in all samples and in all combinations tried. Maximum reduction was noticed in samples inoculated with *A· niger* and *A flavus.* The least reduction was noticed in samples inoculated with *Rhizopus* sp. and *B. subtilis.*

The oil extracted from infected copra also showed considerable variations in colour and odour (Table 2). Different shades of colour were noticed depending on the type of infection. There was rancid odour in all cases. Bacterial infection alone yielded a dark-brown coloured oil with a putrid odour.

Fungus attack on copra reduced the quantity of coconut oil and impaired the quality of oil. Ward and Diener (1961) isolated several fungi from stored peanuts and observed several biochemical changes including loss of oil due to their infection.

Table—1

Reduction in oil content of copra, inoculated with different fungi and combinations of fungi and bacteria

Particulars	Percentage of oil 15 days after incubation	30 days after incubation	Percentage reduction in oil content 30 days after incubation
Control (uninoculated)	63.55	63.76	—
Aspergillus niger	58.10 (54.88)	54.31 (52.00)	14.54 (18.17)
A. flavus	59.31 (54.00)	54.88 (50.68)	13.64 (20.25)
A ustus	60.63 (59.77)	59.48 (56.13)	6.41 (11.67)
Rhizopus sp.	62.11 (62.60)	61.71 (61.24)	2.89 (3.63)
Pencillium	61.00 (61.64)	59.01 (59.55)	7.14 (6.29)
Diplodia natalensis	62.17 (62.51)	60.39 (60.92)	4.97 (4.10)
Trichoderma viride	61.71 (62.00)	58.10 (59.94)	8.57 (5.68)
Cunninghamella verticillata	61.44 (61.56)	58,88 (58.91)	7.34 (7.30)
Syncephalastrum racemosum	62.00 (62 00)	60.34 (59.64)	5.05 (3·01)
Bacillus subtilis	63.40	62.20	2.12

Values in parenthesis shows values for combinations of fungi an *B. subtilis*.

Lalithakumari *et al*. (1971) also reported quantitative loss of oil in groundnuts due to storage fungi A similar quantitative loss of oil due to fungal infection is observed in copra also. AM the fungi observed on copra are capable of utilising coconut oil as a source of carbon for their growth (Eyre, 1932; Sreemulanathan and Nair 1971) and this accounts for the reduction in oil content. Changes in the odour of the oi, observed in all the samples can be attributed to the presence of methyl amyll methyl heptyl or methylnonyl ketones (Stock, 1928), or due to the presence of odoriferous aldehydes or ketones produced as a result of oxidation (Thorpe, 1960).

When copra was inoculated with fungi and bacteria, the reduction in oil content was greater. This may be due to the synergistic action of the two organisms acting on a common substrate.

Table—2

Colour and odour of oil extracted from copra 30 days after inoculation with differentfungi and bacteria

Organisms inoculated	Colour	Odour
Control (Copra uninoculated)	Colourless	Sweet and neutral
Aspergillus niger	Light yellow	Extremely rancid
Aspergillus flavus	Light yellow	Extremely rancid
Aspergillus ustus	Light brown	Rancid
Rhizopus sp	Greyish	Rancid
Penicillium sp	Light green	Rancid
Diplodia natalesis	Reddish orange	Rancid
Trichoderma viride	Light red	Rancid
Cunninghamella verticillata	Light grey	Rancid
Syncephalastrum racemosum	Light grey	Rancid
Bacillus subtillis	Dark brown	Putrid

Summary

Studies on the quantitative and qualitative changes of coconut oil consequent on inoculation of copra with different fungi and *Bacillus subtilis* singly and in combination showed that there was a progressive reduction in oil content and rancidity in all the infected samples. Maximum reduction in oil was recorded in samples inoculated with *Aspergillus niger* and *A. flavus* individually.

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സംഗ്രഹം

കൊപ്രയിൽ ചിലയിനം കുമിളുകളുടെയും *ബാസിലസ് സബ്ടിലിസ്* എന്ന ബാക്ടീരിയത്തിന്റെയും ആക്രമണത്തെത്തുടർന്ന് കൊപ്രയിൽനിന്നും ലഭിക്കുന്ന എണ്ണയുടെ അളവ് ഗണ്യമായി കുറയുന്നതായി കണ്ടു. *ആസ്പർജിലസ് നൈജർ, ആ. ഫ്ളാവസ്* എന്നീ കുമിളുകളാണ് ഏറ്റവും കൂടുതൽ നഷ്ടം വരുത്തിയത്.

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