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DETERIORATION OF COPRA BY FUNG!

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Micro organisms like fungi and bacteria are known to cause deterioration of copra (dried coconut kernel) during drying, transit and storage. Subramonyan *et al.* (1 967) reported that at least 10 per cent of copra is lost as a result of microbial infection during the different stages of drying and storage. Even though some work has been done on the microbial deterioration of copra in other countries, very little information is available on the nature and causes of spoilage in our country. In the present investigation, the different species of fungi causing deterioration of copra and their effect on the oil content and ability to utilise coconut oil as carbon source were studied.

Materials and Methods

Copra collected from oil millsat Trivandrum and Cannanore were used for the study Altogether five samples were drawn from each mill Fungi were isolated and maintained on potato dextrose agar medium. For artificial inoculation and other experiments, copra was prepared from freshly split coconuts by heating in hot air oven at 65°C for 24 hours. The moisture content of copra samples thus prepared was 6.7%.

The effect of fungus growth on the oil content of copra was studied by artificially inoculating oven-dry copra bits each of 5 cm- size. These were placed in sterile petridishes lined with moist filter paper discs along with fungal spore suspensions and incubated at room temperature (28–30C°). Percentage of oil in the different samples of copra was estimated by means of the cold percolation methods of Kartha and Sethi (1957). Utilisation of coconut oil ss carbon source was tested by using Richards solution (without sucrose) as basal medium. Carbon equivalent to 50 g of sucrose per litre of the medium was supplied as coconut oil. Flasks containing 50 ml each of the media were autoclaved at 15 lb pressure for 20 minutes. Those containing coconut oil as carbon source were shaken 1 or 2 hours by means of a mechanical shaker before inoculation with 5 mm diameter culture discs of the test fungi and incubated at room temperature. Growth of the fungi was determined in terms of dry weight of mycelium at intervals of 5, 10 and 15 days.

Results and Discussion

Aspergillus niger, Aspergillus sp., *Penicillium* sp,, *Rhizopus* sp,. *Diplodia* sp,, *Dipiodia* sp., and *Trichoderma* sp. were isolated from copra samples. Of these, *Penicillium* sp , was absent in the samples collected from Trivandrum white *Dipiodia* sp. and *Trichoderma* sp. were not detected in the samples from Cannanore.

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Species belonging to *Aspergillus, Penicillium; Rhizopus and Diplodia* have been reported on copra by eariler workers (Patwarden, 1926; Cooke, 1932; Ward, 1937; Subramonyan *et al*. 1 967). The occurrence of *Trichoderma* sp. on copra has not been reported so far,

All these fungi caused infection in copra under artificial inoculation. The copra pieces were completely covered with mycelial growth within eight days of inoculation. *Aspergillus niger* and *Aspergillus* sp. were found to penetrate deep into the tissues of copra while *Trichoderma* sp. and *Penicillium* sp, did not penetrate deeper within the tissues. The growth ot *Rhizopus* sp. was more or less superficial. A pinkish discolouration was noticed in the case of copra inoculated with *Diplodia* sp.

Effect of infection by fungi on the oil content of copra

Progressive reduction in the oil content was noticed in copra bits inoculated with the fungi. Reduction in oil content was noted in a greater or lesser extent in the case of all fungi. Maximum reduction in oil content occurred in the copra bits which were inoculated with *A, niger.* The initial oil content of 62.86 per cent was reduced to 47 73 per cent as a result of infection by this fungus for a period of three months. Only very little reduction in the oil content was noted in the copra bits inoculated with *Rhizopus* sp. The oil content in copra bits inoculated with *Aspergillus* sp . *Trichoderma* sp., *Penicillium* sp., *Diplodia* sp. and *Rhizopus* sp. were reduced from 62.86 per cent to 51.57, 55.63, 55.96, 54.00 and 59,70 per cent rspectively (Table-1).

A progressive fall in the oil content of copra was noticed in the experiments in which the copra bits were inoculated and stored over a period of three months. This reduction in oil content was noticeable to a greater or lesser extent in the case of all fungi, which indicated that these utilised oil in copra during the course of their growth. It should be noted in this context that copra normally contains a high percentage of sugars. According to Coray (1921, 1924), dried copra meal contains 14.3 per cent sucrose and 1.19 per cent glucose besides other sugars. This indicates that the fungi utilised oil not because of the absence of other easily available sugars. It is likely that these organisms are inherently adopted for utilisingoil and are thus capable of producing enzymes which can act on oil and convert it into mote easily assimilabte forms of carbohydrates. That this is the case with *Aspergillus sp.* isolated from copra has already been shown by Eyre (1932).

Utilisation of coconut oil by fungi isolated from copra

Except *Rhizopus sp.* al! the other fungi grew well in the Richards solution containing coconut oil as carbon source. Between the different organisms, *Trichoderma* sp. exhibited maximum mycelial growth, followed by *Penicillium* sp., *Aspergillus* sp., *A. niger* and *Diplodia* sp., in the descending order. *Rhizopus* sp, did not produce any mycelial growth in the medium (Table–2).

Table 1

Changes in the oil content of copra inoculated with different fungi

Fungus	Percentage of oil in copra after		
	One month	Two months	Three months
Aspergillus niger	54.43	51.66	47.73
Aspergillus sp.	55.66	53.00	51 57
Trichoderma sp.	58.10	56.76	55.63
Penicillium sp.	59.83	58.41	55,96
Diplodia sp.	59.53	58.41	54.00
Rhizopus sp.	61.60	60.73	59.70
Control (uninoculated)	62.82	63,00	63,46

Table 2

Mycelial weight of fungi grown in Richards solution with coconut oil as carbon source.

Fungus	Coconut oil)			Sucrose			No carbon		
	Dry weight of mycelium (in mg) after days								
	Five	Ten	Fifteen	Five	Ten	Fifteer	Five	Ten	Fifteen
Aspergillus niger	930	1290	1307	822	851	1057	30	30	32
Aspergillus sp.	973	1231	1352	922	1063	1135	30	30	20
Trichoderma sp.	863	1041	1450	780	984	1324	30	30	20
Penicillum sp.	781	1263	1438	768	1102	1210	20	30	27
Diplodia sp.	781	949	1261	529	670	980	20	22	24
Rhizopus sp.	No growth								

The results obtained by growing the organisms in Richards solution containing coconut oil also strengthens the inference that these organisms are capable of utilising oil The failure of *Rhizopus* sp. alone to grow in Richards solution is not clearly understood. It may be noted that this organism could grow on copra and cause reduction in the oil content to some extent. Ability to utilise oil as carbon source is probably the prime factor that makes copra a suitable substratum for the growth of the fungi isolated and tested in the present study.

Summary

Fungi *Aspergillus niger, Aspergillus* sp., *Penicillum* sp., *Rhizopus* sp., *Diplodia* sp. and *Trichoderma* sp. were isolated from copra samples. These fungi grew on copra and caused reduction in oil content under artificial inoculation Except *Rhizopus* sp. all the organisms grew well in Richard's solution containing coconut oil as carbon source. *Trichoderma* sp. has not been reported on copra so far.

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സംഗ്രഹം

അസ്പർജില്ലസ് നൈജർ, പെൻസിലിയം സ്പിഷീസ്, റൈസോപ്പസ്, സ്പിഷീസ്, ഡിപ്ലോഡിയാ സ്പീഷീസ്, ട്രൈക്കോഡെർമാ സ്പീഷീസ് എന്നീ കുമിളുകൾ കൊപ്രായ്ക്ക് കേടുവരുത്തുന്നതായികണ്ടു. ഇവയിൽ ട്രൈക്കോഡെർമാ കൊപ്രായിൽ ഇദം പ്രഥമമായ റിപ്പോർട്ടാണ്. കുമിളുകളുടെ വളർച്ച മൂലം കൊപ്രായിലുള്ള എണ്ണയുടെ തോത് ഗണ്യമായി കുറയുന്നതായികണ്ടു.

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