

MICROFLORA OF DRIED GINGER VARIETIES

C Balagopal, D. Joseph Bagyaraj and E. V. G. Nair

Horticultural Research Station, Ambalavayal, Kerala

India is by far the largest producer and exporter of ginger. Though ginger is grown in many states in India, the major production of this important crop is confined to Kerala. It is a usual practice to dry the green ginger rhizomes in sunlight and convert it into dry ginger. The dry ginger is usually used for the extraction of oleoresin and preparation of ginger powder. It is also an important ingredient in various Ayurvedic medicines. Dried spices are not subjected to microbial spoilage normally, although mold growth during the processing may give them a heavy load of mold spores (Frazier, 1967). Heavy load of molds, *Esehorichia coli* and pathogens like *Salmonella-shigella* on dried ginger may be hazardous to health when used for various purposes.

Work on the microbiological quality of ginger seems to be scanty. It is therefore desirable to study the incidence of microflora in processing the ginger varieties. This will help to improve the hygienic quality of ginger which will be welcomed by foreign market.

Materials and Methods

Ten grams of dried ginger varieties available at the Horticultural Research Station, Ambalavayal, six months after harvest and processing were used for the present studies. The ginger varieties Rio-De-Jonaire, Maran, Johurt, Mysore, Mananthody, Assam, Himachal Pradesh, Nadiya, Siraleon, Thingpuri, Thinladium and Thura were examined. The samples were transferred to sterile water blanks aseptically and plating by serial dilution technique was adopted. The enumeration of the population of bacteria, actinomycetes and fungi was carried out on Soil-extract agar, Kuster's agar and Martin's rose bengal-streptomycin agar, respectively (Allen, 1957). Population of *E. coli*, *Salmonella* and *Shigella* were estimated following the procedure of Harrigan and Margaret (1969). The statistical significance of the data on microbial numbers was ascertained by the two way analysis of variance (Snedecor, 1961) with more than one observation per cell.

Results and Discussion

Bacterial and fungal populations were present on all the varieties of ginger tested while actinomycetes were absent (Table 1). Quantitatively the

bacterial population was more than the fungal population. The results indicated that the varieties Siraleen and Thinladium harboured significantly more numbers of bacteria and fungi respectively over the others while the varieties Himachal Pradesh and Thingpuri harboured minimum bacterial and fungal population respectively.

None of the varieties harboured *Salmonella-shigella* population. *E. coli* was absent on all the varieties tested except the variety Johurt which harboured a population of 100 cells/g.

The percentage of fungal flora based on the morphological groupings occurring on different varieties of ginger are given in Table 2. *Fusarium* was found to occur in maximum numbers on all the varieties of ginger followed by *Aspergillus*, *Penicillium*, *Rhizopus*, *Yeasts* and *Mueor*.

Table 1
Distribution of microflora of dried ginger varieties
(Population in $10^x/g$ samples)

Name of variety	Bacteria ($10^6/g$)	Actinomycetes ($10^4/g$)	Fungi ($10^5/g$)
Siraleon	54.20	Nil	14.70
Nadiya	42.10	, ,	25.10
Mysore	28.20	, ,	13.20
Thinladium	28.20	, ,	26.20
Thingpuri	26.10	, ,	0.80
Johurt	23.30	, ,	9.80
Thura	18.50	, ,	6.60
Rio De Jeneiro	17.30	, ,	14.60
Maran	16.30	, ,	13.70
Mananthody	15.80	, ,	10.00
Assam	14.50	, ,	9.10
Himachal Pradesh	10.90	, ,	12.10
C. D. at 5 percent level } =0.90		C. D. at 5 percent level } =0.50	

The results of the present investigation indicate that both qualitatively and quantitatively the microbial population varied with the varieties of ginger. The presence of *Fusarium* as the dominant fungus on all the ginger varieties

Table 2

Morphological grouping of the fungal flora of dried ginger varieties
(Expressed as percent of total flora)

Name of the varieties	Aspergillus	Penicillium	Fusarium	Mucor	Rhizopus	Yeast	Miscellaneous
Rio-De-Jeneiro	6.80	3.50	74.00	15.00	-	4.50	12.20
Maran	"	"	80.00	"	"	2.00	3.00
Johurt	3.50	3.00	86.00	-	3.00	4.00	0.50
Mysore	"	"	90.00	"	"	"	10.00
Mananthody	"	15.00	74.50	"	10.50	"	"
Assam	10.00	8.00	75.00	"	"	10.00	7.00
Himachal Pradesh	12.80	15.00	64.60	"	2.20	3.40	2.00
Nadiya	"	"	95.60	"	"	"	4.40
Siraleon	"	"	89.20	"	"	"	10.80
Thingpuri	5.50	10.50	80.00	"	"	1.00	3.00
Thinladium	"	"	80.00	"	"	"	20.00
Thura	"	1.20	76.00	"	"	2.80	20.00

was observed in the present studies. Christensen and Kaufman (1965) designate *Fusarium* and certain other fungi as "field fungi" which usually do not continue to grow in the produce after harvest. The prevalence of this genus could be the result of post harvest storage of the rhizomes.

In spite of the intensive nature of the processing, *E. coli* and pathogens like *Salmonella-shigella* were absent on all the varieties, though on the variety Johurt a negligible percentage of *E. coli* cells were recorded. It may be concluded that the microbial population of the ginger varieties can be still reduced by careful processing under more hygienic environments.

Summary

Attempts were made to enumerate the various microorganisms viz, bacteria, actinomycetes and fungi present on 12 varieties of dried ginger. Bacteria and fungi were present on all the varieties of ginger tested while actinomycetes were absent. Bacterial population was more than the fungal population. The varieties Siraleon and Thinladium harboured significantly more number of bacteria and fungi respectively over the others while the varieties Himachal Pradesh and Thingpuri harboured minimum bacteria and fungi respectively. *Fusarium* was the dominating fungus on all the varieties. None of the varieties harboured *Salmonella-shigella* population. Similarly population of *E. coli* was also absent on all the varieties tested except on the variety Johurt, which harboured a population of 100 cells/g of the sample.

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REFERENCE

- Allen, O. N. 1957 *Experiments in soil Bacteriology*, Burgess publishing company. Minnea Polis, Minn, U S. A.
- Christensen, C. M. and Kaufman, H. H. 1965 Deterioration of Stored grains by fungi. *Ann. Rev. Phytophthal*, 3 69-84
- Harrigan, W. F. and Margaret, E. M. 1969 *Laboratory Methods in Microbiology*, London.
- Snedecor, G. W 1961 *Statistical methods*. The Iowa state Univ. Press, Ames, Iowa.

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