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DEVELOPMENT AND DESIGN OF A PROCESS LINE FOR THE PRODUCTION OF GINGER OLEORESIN AND ESSENTIAL OILS.

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ABSTRACT

This paper presents an improved process for the production of Ginger Oleoresin and Essential oils. The process line discussed in this paper has an established property which distinguishes it from all other ginger products and that is more yield of extracts of essential oil and oleoresin.

INTRODUCTION

Ginger (Zingiber officinale Rosee) is a root like agricultural product. India is the major producer of ginger, producing as much as 50% of the total world production: Jamaica, Nigeria, Sierra Leone, Japan and Australia are other producing countries.

There are two types of ginger namely''

(i) Green ginger

(ii) Dry ginger

Large proportion of the ginger is consumed in the green form in the producing countries. The green ginger is dried, mostly for export. The difference in flavour between green and dry ginger is quite marked. The refreshing lemon odour of green ginger is preferred in cookery. The odour is evidently due to the presence of a high proportion of monoterpoid compounds, especially citral, in fresh material. Dry ginger has a slight musty odour. The ginger rhizome as a spice, has both aroma constituents and pungent principles. The formers are contained in the essential oil. Compared with spices such as cardamom and pepper, ginger requires a longer time of distillation, probably because of the presence of large proportion of high boiling constituents like sesquiterpenes.

A large number of monoterpenes, sesquiterpenes and their oxygenated derivatives has been reported as a constituents of ginger oil, it has been suggested that the monoterpenes compounds and compounds of similar boiling ranges are more important to the final aroma, than the major constituent of sesquiterpenes which a generally weakly aroma when purified 8 Connel, and Jordan believe that the typical citrus-like aroma of Australian ginger is due to a relatively higher proportions of citrals geranial and neral – in the essential oil. Of all the Indian varieties of ginger natarajan et al 12 found an only moderately high content of oil in Rio-de-Janeiro.

TABLE 1

Composition of Rio-de-Janeiro variety of ginger:

Constituent	Amount (per cent)
Moisture	7
Volatile Oil	2.5
Acetone extract	10.3
Protein	11.1
Fibre	9.4
Starch	43.4
Ash	9.4

There are four important commercial varieties of ginger which are available for extraction. These differ in appearance and contents and quality of oil and non-volatile extract (Table II).

Although these values are important a greater emphasis is placed on the overall flavour quality of different varieties of ginger. Thus Jamaica ginger is considered better than any other variety, by virtue of the delicate odour and flavour of its oil. Cochin ginger is valued for its lemon-like odour and flavour. Nigerian ginger resembles the Jamaica ginger.

TABLE II

Analysis of important commercial varieties of ginger:

Variety	Appearance	Flavour Characteristic	Volatile Oil Non v/w%	Volatile Extract (LDC) %
Cochin	Bold, light, brown, partly peeled	Lemon-like odour and flavour	2.2	4.25%
Jamaican	Bold, very light, clearly peeled.	Delicate aroma and flavour	1.0	4.4
Nigerian	Bold, light colour, partly peeled, hibrous	Very pungent, camphoraceous flavour	2.5	6.5

FUNCTIONS OF GINGER

Ginger characteristics aroma and spicy flavour comes from its pungent yellow oil, which contains spicy sweet zingerone, plus a number of sharpy flavoured chemicals such as borneol (which smells like pepper and tastes like mint). Eucalyptol (which smells like camphor and has a spicy cooling taste) and lemony scented cital. It prevents oxidation, slowing the rate at which fats combine with oxygen and turn oxygen and turn rancid. Zingerone is a pungent chemical that stimulates pain receptors in the skin and mucous membrane.

Ginger also relieves the misery of motion sickness. Zingerone initiates skin and mucous membrane. Applied to the skin, ginger makes the small blood vessels just under the surface dilates, increasing the flow of blood to the area and making the skin feel warm. It also initiates the mucous membrane lining the nose and throat causing them to "weep" watery secretions. This leads to easy access of blowing nose or coughing up mucous when someone has cold (Carol Ann, 1978).

USES OF GINGER

Ginger is one of the earliest oriental species known as Europe and is still in large demand today. The dried rhizome which is scrapped or peeled before drying constitutes the spice and is esteemed for its flavour, pungency and aroma. ln Western countries, it is widely used for culinary purposes in ginger bread, biscuits, cakes, pudding soups, and pickles. It is also used in the production of ginger bear, gingerate and ginger wine. It was formerly used for spicing wines such as possets and porter.

Preserved ginger is prepared by boiling tenders, freshly peeled rhizomes after which it is boiled and soaked in a sugar syrup. Crystallized ginger is produced in the same way but it is dried and dusted with sugar. The rhizome yields an essential oil but this lacks the pungent principle. It is used in the perfumery. The oleoresin extracts in which the full pungency of the spice is preserved is used for flavouring and medicinal purposes (SIMMONDS, N. W, 1976)

DEVELOPMENT AND DESIGN OF A PROCESS LINE FOR THE PRODUCTION OF GINGER OLEORESIN AND ESSENTIAL OILS

In general ginger is processed for the industrial market in two major forms. The fresh green ginger is used for the preparation of ginger beer in Nigeria and the dried or cured ginger is employed in the spice trade for the preparation of oleoresin and essential oils. The cured ginger has both the aroma constituents and the pungent principles. The former is contained in the essential oil while the later is found in the oleoresin.

My work centred on the improvement of yield on the production of these two vital raw materials for the food processing and pharmaceutical industries. Conventionally, ginger essential oils are obtained by distillation of coarsely ground ginger powder in a specially designed still and the yield of oil by this method was not higher than 2%.

Coarsely ground ginger was passed through a sieve mesh opening of 0.59mm. The obtained powder was filled half way into a stainless steel extractor. The layer of ginger powder was covered with acetone. Acetone was chosen and used as solvent, after having tried all other solvents and allowed to stand for three hours. The acetone was allowed to percolate the ginger powder and drained slowly at the rate of one drop per second. At the end of the drainage, fresh acetone was added to soak through the powder and again allowed to stand for one hour, and drained as before into the collected extract. The extract was filtered through fast filter paper and then evaporated under vacuum at 70°c. The evaporation was allowed to continue until no further drop of acetone could be collected. The collected residual extract settled into two layers in a setting tank. The upper layer constituting the essential oils was decanted into glass container and stored while the bottom layer constituting the oleoresin was also collected and stored.

CONCLUSION

The process line has one established that has distinguished it from all other ginger products, and that is, more yields of extracts of essential oil and oleoresin.

PRODUCTION DATA FOR TOTAL EXTRACT

a Total extract yield 18.34% V/W

b Description of total extract obtained:

Dark brown liquid with characteristic ginger aroma, setting into yellow mobile portion and viscours dark brown portion and a viscous dark brown portion.

c Total solid content (extract) 66.8%

d Ash content (extract) 1.45%

30mls of the total extract was subjected to fractional distillation.

	Temperature Range	Vol. of Distillate	% Distillate	Appearance
a	60-62°c	2.4ml	7.2	Colourless liquid
b	80-90°c	2.9ml	8.4	" "
c	92-98°c	1.2ml	3.8	Light yellow oil
d	99-106°c	4.3ml	12.5	Brownish oil
e	Above 195°c	-	-	-
f	Residue	19.2ml	68.1	Resinified Brown

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