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SEASONAL ACCUMULATION OF CHEMICAL CONSTITUENTS IN GINGER VARIETIES (*ZINGIBER OFFICINALE* Roscoe)*

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ABSTRACT

Seven ginger varieties were used to study the trends in oleoresin accumulation using ethyl alcohol and acetone as solvents. On dry weight basis, oleoresin content was seen to decrease with maturity. Crude fibre content gave decreasing values towards maturity. Alcohol showed better extraction capacity than acetone.

INTRODUCTION

GINGER, *Zingiber officinale* Roscoe, is one of the major spice crops. It is used for its pungency, aroma, and medicinal properties. Only a few studies have been carried out on its chemical composition. Thresh (1879) studied, for the first time, the chemical composition of commercial grades of ginger. Afterwards, similar studies have also been made by Benfield (1950), Winterton and Richardson (1965), and Natarajan *et al.* (1970). In the present study, the seasonal accumulation of oleoresin and related chemical constituents of eight promising ginger cultivars of India were studied.

MATERIALS AND METHODS

Samples of ginger rhizomes having uniform maturity were collected at monthly intervals, beginning with three months of sowing. They were then separated into main dual fingers, the adhering soil particles were removed by washing in cold running water, and then air-dried. They were then sliced to a thickness of about 4 mm and dried to constant weight at $55^{\circ} \pm 2^{\circ}$ C in a cross-flow air oven. Dry weights were then noted. The dried samples were then ground in a Multiplex grinding mill to pass through mesh No. 60 (Endecotts Ltd., London), stored in glass-stoppered bottles, and used for chemical analysis.

Oleoresin was extracted in both absolute alcohol and 100% acetone, in cold, using 10 g ground samples for each determination. The solvent was allowed to evaporate off

in vacuum. Crude fibre was estimated from the defatted ginger powder left after oleoresin extraction (A.O.A.C., 1960).

RESULTS AND DISCUSSION

The Effect of Solvents.—The variety used for this with the two solvents, absolute alcohol and acetone, was *Maran*. Alcohol was able to extract 3.5–10.1% more oleoresin than acetone (Fig. 1). The average difference was about 6.7%. This is in agreement with the observations of Winterton and Richardson (1967).

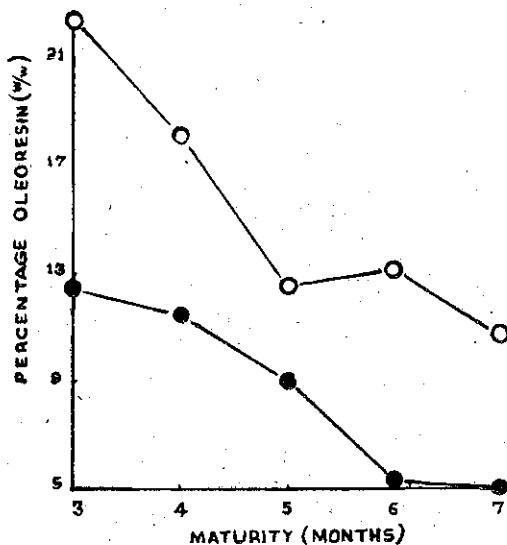


Fig. 1. Yields of oleoresin in variety *Maran* using alcohol and acetone as solvents (dry weight basis). Alcohol O — O, Acetone ● — ●.

* Contribution No. 116, Central Plantation Crops Research Institute, Regional Station, Vittal.

Accumulation of Oleoresin.—The rate of accumulation of oleoresin was studied at monthly intervals in all the eight varieties (Fig. 2).

It shows a steady accumulation of it till the fifth month of growth followed by a slower rate of increase afterwards to maturity.

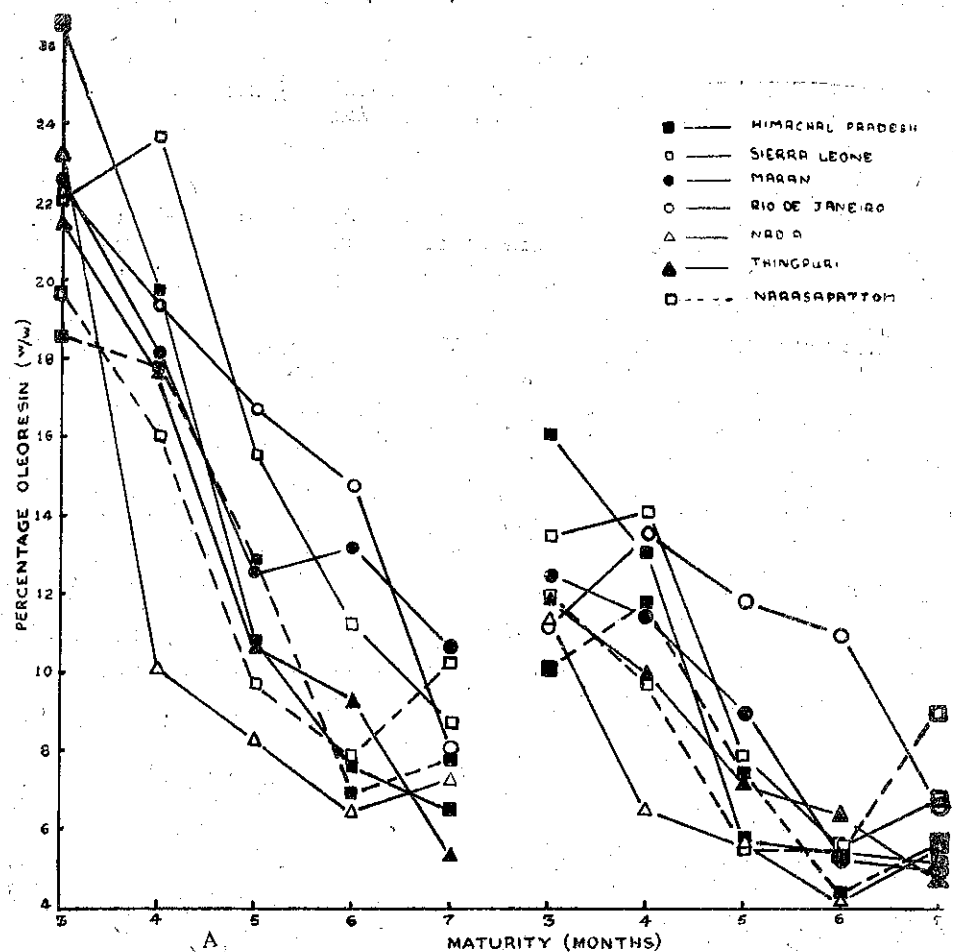


FIG. 2. Seasonal oleoresin accumulation percentages of ginger varieties on dry weight basis
A—Alcohol extracted, B—Acetone extracted.

Both absolute alcohol and acetone were used as organic solvents. In general, the varieties exhibited a reduction in the amount of oleoresin present with increase in maturity (on dry weight basis) (Fig. 6). This reduction is, however, only relative and is not caused by an actual lowering of oleoresin content but by an increase in the various constituents of ginger which form the dry matter. This conclusion is confirmed by the data presented in Fig. 3, which represents the percentage accumulation of oleoresin on green weight

basis. It shows a steady accumulation of it till the fifth month of growth followed by a slower rate of increase afterwards to maturity. Essential oil is an essential part of oleoresin. Ginger produces galenical oleoresin. The number of oil-producing cells increases with the development of rhizomes and it brings about a corresponding increase in essential oil content. This may account for the marginal rise in oleoresin content with maturity (Fig. 3). The varieties *Himachal Pradesh* and *Nadia* accumulated maximum oleoresin in the early stages while at maturity *Narasapattom* and *Maran* showed greater accumulation.

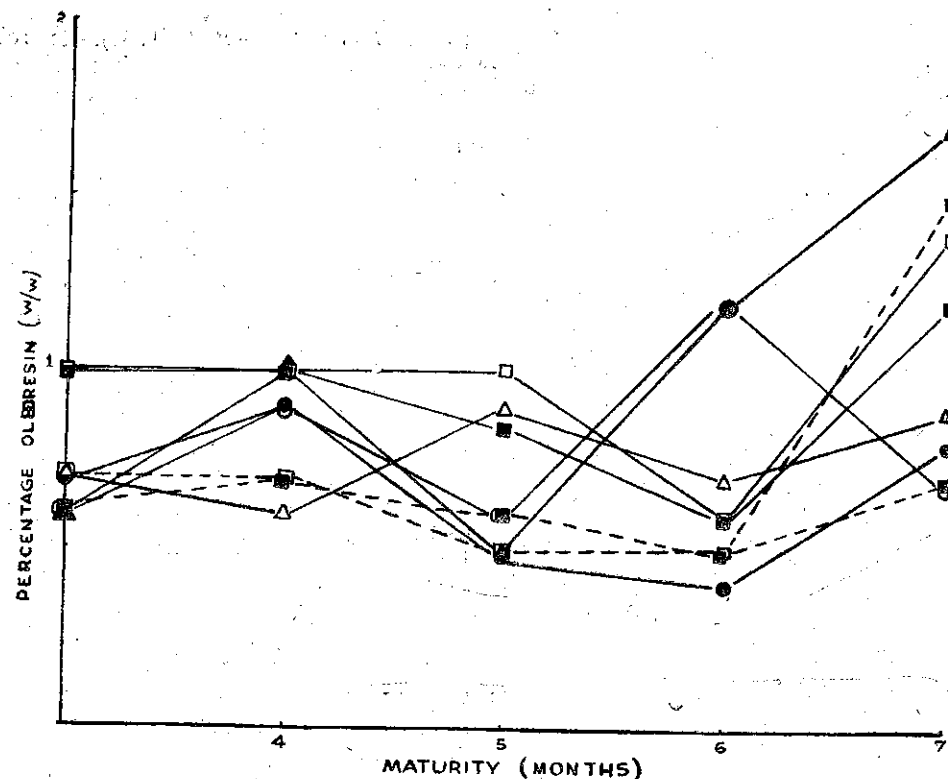


FIG. 3. Seasonal oleoresin accumulation percentages of ginger varieties on green weight basis (Acetone extracted).

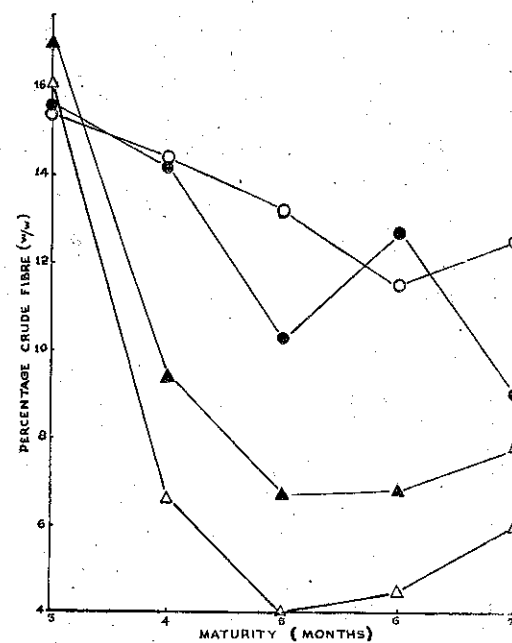


FIG. 4. Seasonal crude fibre accumulation percentages of ginger varieties (Dry weight basis).

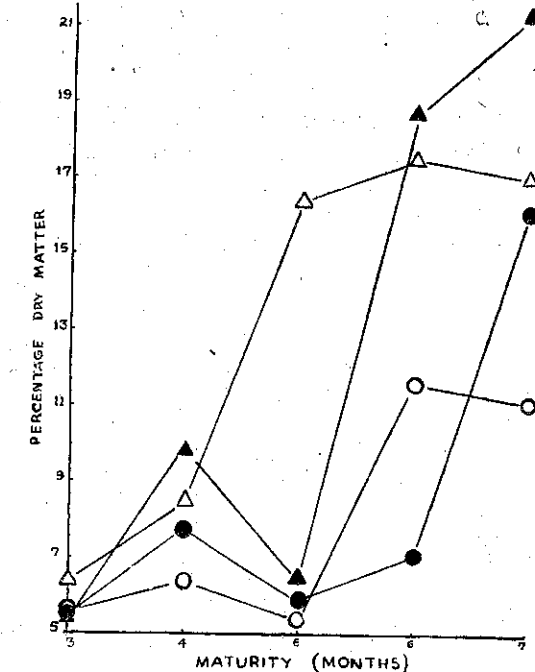


FIG. 5. Seasonal dry matter accumulation percentages of ginger varieties.

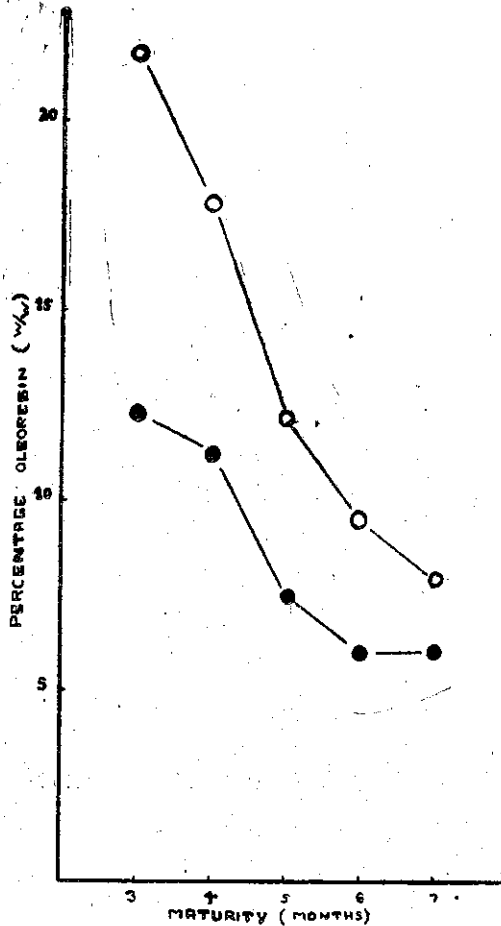


FIG. 6. Average oleoresin yield in ginger varieties using alcohol and acetone as solvents (Dry weight basis).

Crude Fibre Content (Fig. 4).—Its relative proportion showed a descending curve with maturity. A positive correlation is noticed between crude fibre content and oleoresin content during the various stages of tuber development (unpublished data). Hence the varieties containing more fibre and the stage of maturity with the maximum fibre content are the two favourable conditions to be considered for obtaining maximum oleoresin yield.

Dry Matter.—It increased with maturity (Fig. 5).

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