Evaluation of commercially important chemical constituents in wild black pepper types

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Abstract. Matured black pepper berries from 8 wild types, on chemical screening, showed wide variations in commercially important constituents. The results have been compared with those of the cultivated varieties. The possibility of exploitation of this information in black pepper quality improvement programmes is discussed.

Introduction

The black pepper of commerce is the matured, dried berry of a climbing vine, *Piper nigrum* Linn, of the family Piperaceae. This vine grows from the sea level to an altitude of 1500 meters. It is a plant of the humid tropics requiring adequate rainfall, high humidity and warm climate for its growth. It prefers an annual rainfall of over 250 cm, is tolerant to a temperature range of 10 to 40°C, and thrives well in rich humus soil.

Black pepper is considered to be one of the most ancient crops cultivated in India, and probably originated in south-western India, the region comprising the forests and ghats of Kerala and the North Kanara region of Mysore up to Kanyakumari, where it grows wild on the rich, moist, humus soils [7].

There are more than 70 cultivated varieties of black pepper existing in India [9]. They differ in size and colour of berries, length and shape of spikes, yield, and in resistance to diseases and pests.

Marked difference in the chemical composition of berries due to genetical and other factors is observed. Due to difference in the concentration of terpenes and other oxygenated compounds, wide variations in the odour quality of pepper oils from the cultivars have been observed. The yields of NVE (Non-Volatile Extracts) and also the piperine content of NVE differ widely in some of these varieties. Many *P. nigrum* vines are seen to flourish well in the Western Ghat forests of S.W. India.

The chemical compositions of berries, stalks and husks of cultivated varieties, trade grades and by-products have been studied in the past [4–6]. In the present study, eight wild types of black pepper (berries) were screened for their commercially important chemical constituents. This information could be of use in programmes for the improvement of the chemical quality of black pepper.

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Material and methods

The materials for the present study were collected from the Western Ghat forests of south-western India. Eight types of matured wild pepper berries were selected for this study. The specimens representing the collections were deposited at the spices and cashew breeding section of the Central Plantation Crops Research Institute, Regional Station, Vittal, India and also at the Pepper Research Station, Panniyoor, Kerala State, India.

Oleoresin was extracted, from the matured dried berries milled separately to fine powder, by the cold percolation method, using 100 per cent acetone, at room temperature.

P. nigrum is the rich known source of the pungent alkaloid piperine which is a trans, trans-5-(3, 4-methylenedioxyphenyl)-2, 4-pentadienoci acid piperadide. It is a yellow crystalline material which contains chavicine (cis-cis), iso-piperine (cis-trans), and iso-chavicine (trans-cis) isomers of piperine [2, 3]; piperettine[11]; piperanine [12] and pyrroperine [8]. On the basis of the available information, all the above mentioned alkaloids together answer for the pungency of this spice. The degree of pungency varies among these alkaloids. Alkaloids, other than piperine, are found in minute quantities. Hence, for screening for maximum total pungency, the present method is used wherein all the above constituent alkaloids are estimated *in toto*.

About 200 mg of the oleoresin was refluxed in 50 ml of 2N KOH in propylene glycol for 2 hours over a sandbath at around 140°C. The piperidine released by the hydrolysis of amidic bonds by this procedure from all constituent alkaloids is dissolved in the acetone extract. To 1 ml of this solution (containing the piperidine) was added carbon disulfide to convert it to piperidinium pentamethylene dithiocarbamate which gives a yellow colour with copper sulfate to form copper piperidine.

Piperine in berries

No apparent relationship appeared to exist between high oleoresin and piperine contents in the black pepper berries studied. A high oleoresin yielder like Thekkady-4 has a piperine yield of about 4 per cent whereas a medium oleoresin yielder like Thekkady-6 has the highest piperine yield of 13.7 per cent, and Thekkady-2 (a medium oleoresin yielder) has pungent alkaloids in traces only.

Thekkady-6 seems to be very rich in piperine content. This is about 2½ times more pungent than the common cultivers. It is quite interesting to note that two of the wild types are without any pungency, but have the black pepper aroma.

Piperine in oleoresin

Thekkady-6 is outstanding in this characteristic with 84 per cent pungent

alkaloids. From the experimental spectrophotometric values obtained (absorption maxima at 435 μ), pungent constituents were calculated using the formula given in the method of Shankaranarayana et al [10] and are reported as percentage piperine.

Crude fibre was estimated by the A.O.A.C. method (1970).

Results

The results obtained are compared with those of the cultivated varieties in Table 1.

Table 1. Oleoresin and piperin contents of wild black pepper types

Types	Oleoresin %	Pungency in berries as piperine %	Pungency in oleoresin as piperine %	Crude fibre %
Konny	8.5	1.8	21.7	5.5
S.P. Puram 1	13.5	2.8	20.5	9.0
Silent valley 1	13.0	6.0	45.2	11.3
Thekkady 4	25.7	5.0	19.7	17.6
Sholayar 6	6.4	2.0	40.0	6.6
Thekkady 2	12.7	*Traces*	12.7	12.2
Thekkady 6	16.3	13.7	84.0	19.0
Sholayar 3	8.9	*Traces*	9.0	5.1
Cultivated varieties	3.9 – 11.4	1.7 – 4.9	25.0 – 55.0	8.6 – 15.6

Oleoresin

The oleoresin per cent varied from 6.4 to 25.7 in the wild types. Some very promising oleoresin yielders are present in this group as compared to the cultivated varieties.

Crude fibre

The crude fibre varied from 5.1 to 19.0 per cent. High crude fibre yielders are also observed to be rich in their oleoresin content. This tendency appears to be true, as in ginger rhizomes (unpublished).

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