

## CHEMICAL ANALYSIS OF TRADE GRADES AND BY-PRODUCTS OF PEPPER (*Piper nigrum* L)

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In 1957-58, India exported 13,600 tons of pepper, earning a foreign exchange to the tune of 2.8 crores of rupees. In an earlier communication, Dwarakanath *et al.*<sup>1</sup> have reported data on the chemical analysis of some varieties of Indian pepper (*Piper nigrum* L.). Some of the important varieties in the world market are the trade grades of India and Malaya. Hence, it was of interest to analyse the trade grade samples of both the countries.

Pepper is generally immune from insect attack, though sometimes we come across hollow berries ascribed to 'pollu disease'. But very often during monsoon months, and in coastal godowns, due to high humidity pepper gets infested with some moulds. We were able to secure samples of the two types of infested pepper and have analysed them, with a view to finding out the changes in the active constituents as compared to healthy pepper.

Moreover, during the grading of pepper, by-products and wastes such as 'pepper rejections', 'stems and inflorescence stalks', and *Varagu* or unfertilised buds, remain on hand. We have analysed these wastes and by-products with a view to determining the active principle present and also to devising ways for the better utilization of these products.

### Materials and Methods

The material consisted of trade grades of Indian and Malayan pepper, both black and white, common bazaar pepper, insect infested and mouldy pepper, trade wastes and by-products such as 'pepper rejections', *Varagu* and stalks. The chemical analysis was carried out according to the methods outlined in A.O.A.C.<sup>2</sup> The results of the analysis are presented in Table I.

### Results and Discussion

The results of analysis of trade grades indicate that the acid insoluble ash ranges from 0.03 to 0.26. This is well within the specified standard, *i.e.*, 1.5 per cent. In practice, this represents the foreign matter such as sand etc., which has to be well within limits in good

quality pepper. The values for ether extract and alcohol extract are within the standard figures, namely, 6.75 and 7.0. Among the graded varieties, Malabar black pepper, garbled F.A.Q., has the highest ether and alcohol extract values, namely, 10.85 and 9.88; while that of the Malayan black pepper are 8.69 and 8.42. In the matter of the 'volatile ether extract' which indicates flavour and aroma, Malabar black pepper has a value of 2.32 as compared to Malayan black pepper with 1.02 and the bazaar black pepper with 0.81, which is the lowest.

In the case of white pepper, total ash and acid insoluble ash should not exceed 3.5 per cent and 0.30 per cent respectively. The values for both Malayan and Indian white pepper are well within the range. Malayan white pepper has a slightly higher value in ether and alcohol extracts, but at the same time has a very high moisture content of 12.27 per cent.

Regarding the insect infested and mouldy pepper, the analysis reveals that vital factors such as total ether and alcohol extracts are in no way less than that of good quality pepper. Mouldy pepper can therefore be reclaimed by suitable antifungal treatment. The insect-infested pepper has hollow berries and its starch content is also low, 40.95. Hence, we can try to use this with other by-products to produce the oleoresin of pepper.

Lastly, we have three types of trade by-products, *viz.*, rejections, *varagu* and stalks. Analytical data show that 'varagu' and 'stalks' have very low ether soluble fractions and very high crude fibre, 27.75 per cent and 32.29 per cent respectively.

In contrast to these two, we have 'pepper rejections' which has given the highest ether extract, 14.44 per cent and alcohol extract 13.36 per cent. This being a rich source of the bite factor, we have extracted the oleoresin from this and by suitable processing a new flavouring product known as 'pepper-sal' has been prepared. The details of the technological aspects of 'pepper-sal' together with storage, stability and consumer

TABLE I. Chemical analysis of trade grades and by-products of pepper (*Piper nigrum* L)

A	Trade grade samples from India and Malaya	Moisture %	Total nitrogen %	Nitrogen in 100 g. of non-volatile ether extract %	Ether extract			Alcohol extract %	Crude fibre %	Ash			Starch % by acid hydrolysis
					Total ether extract %	Non-volatile ether extract	Volatile ether extract			Total ash %	Water soluble ash %	Acid insoluble ash %	
1	2	3	4	5	6	7	8	9	10	11	12	13	14
1	Tellicherry black pepper, garbled special bold	9.57	2.00	3.16	7.41	6.17	1.24	7.46	13.98	4.55	2.48	0.08	47.25
2	Tellicherry, black pepper, garbled F.A.Q.	9.88	1.98	3.55	8.02	7.00	1.02	8.28	14.51	4.35	2.48	0.07	45.00
3	Malabar black pepper, garbled F.A.Q.	11.20	1.85	3.49	10.85	8.53	2.32	9.88	13.81	4.83	2.76	0.03	43.65
4	Malabar black pepper, ungarbled	10.30	1.89	3.58	11.61	9.87	1.74	11.52	16.43	4.93	2.88	0.18	40.95
5	Malayan black pepper ...	10.74	1.84	3.92	8.69	7.67	1.02	8.42	12.15	3.60	1.66	0.26	48.15
6	Bazaar sample black pepper	11.37	2.23	3.47	8.00	7.19	0.81	7.88	15.26	4.94	3.31	0.16	41.85
7	Malayan white pepper ...	12.27	1.76	3.72	9.12	8.09	0.03	8.72	5.17	1.06	0.02	0.05	59.40
8	Indian white pepper ...	10.60	2.01	3.83	7.86	7.35	0.51	7.22	6.18	2.79	0.76	0.12	56.25
B <i>Infested pepper varieties</i>													
9	Insect-infested pepper ...	10.97	2.18	3.62	8.41	7.89	0.52	11.04	15.78	4.35	2.53	0.32	40.95
10	Fungus-infested pepper (Cochin godown) ...	12.02	2.06	3.79	7.29	6.56	0.73	9.70	15.12	5.05	1.90	0.83	43.65
C <i>Trade wastes and by-products</i>													
11	Pepper stems and inflorescence stalks ...	9.15	1.94	2.72	4.69	4.21	0.48	6.18	32.20	9.37	5.50	0.40	16.94
12	Pepper rejections ...	11.31	2.15	3.38	14.44	12.44	2.00	13.36	26.25	8.02	5.31	0.45	21.15
13	Varagu (unfertilized buds)	9.30	2.19	1.51	2.62	2.34	0.28	4.26	27.25	13.07	6.35	1.61	14.40

acceptance trials will be presented in a separate paper.

#### Conclusions

(i) Analysis has revealed that Indian trade grades are of good quality and above the standards prescribed; Malabar black pepper, garbled F.A.Q., being better than the Malayan black pepper.

(ii) Mould infested pepper, having suffered no damage in chemical constituents, can be reclaimed.

(iii) The insect-infested pepper and 'pepper rejections' being good sources of the 'bite' factor, oleoresin can be prepared and used for the production of a new flavouring agent, 'pepper-sal'.

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#### REFERENCES

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