ALKALINE OXIDATION VALUE AS INDICATOR OF ADULTERATION OF SCENTED BASMATI RICE WITH NON-SCENTED RICE VARIETIES

N.M. Vaingankar and P.R. Kulkarni

Department of Chemical Technology, University of Bombay, Bombay 400 019, India

Preliminary studies on alkaline oxidation values of scented and non-scented rice varieties suggested that alkaline oxidation value could be used to detect adulteration of Basmati rice with cheaper and similar non-scented varieties of rice.

Key words: Alkaline oxidation value, Basmati rice, Adulteration.

INTRODUCTION

India is one of the largest rice growing countries in the world. In India, besides the numerous non-scented rice varieties, many scented varieties like Basmati-370, Type-3, Ambemohor-157, Improved Sabarmati, Kalimuch are cultivated. These scented varieties command high premium in the local as well as international markets for their characteristic aroma. There are some reports on the flavour volatiles of rice varieties [1-6].

Basmati rice varieties are the highly priced among all these scented varieties and are many times adulterated with non-scented cheaper varieties resembling them in appearance. However, there is no reliable test to detect this adulteration due to which consumers can easily be cheated. Recently, from our laboratories, the differential length breadth ratio, has been reported to be a reliable indicator of such adulteration of Basmati rice [7]. As an extension of this work, it was attempted to explore the possibility of using alkaline oxidation value (AOV), which represents reducing flavour volatiles of rice varieties, as an indicator of adulteration of scented rice with non-scented rice varieties. The preliminary observations on these experiments are reported in this communication.

EXPERIMENTAL

Pure, random sample of Basmati-370 was procured from Agricultural Research Station at Kapurthala, Punjab. Export sample of Basmati was procured from marketing and Inspection office, Bombay. Commercially available Basmati was also used for the present study. Random, non-scented varieties of rice viz. Mahsuri, Karjat-14-7, Ratna and Pankaj which did not resemble Basmati in any of the characteristics were procured from Rice Research Station, Konkan Krishi Vidyapeeth, Karjat. Scented varieties of rice viz. Vadgaon-3-51-18 and Vadgaon-4288 were obtained from Rice Research Station, Mahatma Phule Krishi Vidyapeeth, Vadgaon, near Pune. Saket-4 (non-scented) variety resembling Basmati-370 in most of the characteristics except flavour was obtained as white polished rice from Manipuri, Uttar Pradesh, India.

Pure cultivars of Basmati 370, Pusa 169, PR-106 and Improved Sabarmati of the same age were also procured from I.A.R.I. New Delhi. Pure random sample of adulterant Parimal was obtained from a local reliable source, while adulterants like Lakra, Kali Much were obtained from a farm at Jhansi. All the paddy samples were dehulled and polished simultaneously to yield white kernels in a huller, kohinoor R.No. 197925, situated at Bolinj, near Virar, Bombay. Admixtures of Basmati and three common adulterants of same age were also prepared. 10 g each of pure Basmati, pure adulterant and the admixture having composition of 60 % pure Basmati and 40 % pure adulterant, both of same age, were subjected to steam distillation. A fixed vol. of 70 ml of distilled water was added prior to steam distillation. A fixed volume of 50 ml steam distillate was collected in each case. Alkaline oxidation value was determined on 2 ml aliquots of steam distillate [8] and calculated as the number of parts by weight of oxygen, required to oxidise 100,000 parts by weight of sample under standard conditions.

RESULTS AND DISCUSSION

Initially data on AOV of all the scented and non-scented rice varieties collected as random samples of unknown age and also of known age were collected. Table 1 shows the comparison of AOV of scented and non-scented rice varieties. The alkaline oxidation value is inversely related to reducing flavour volatiles. Therefore, as expected, all the scented varieties showed much lower AOV than all the nonscented varieties, indicating clearly that the scented varieties are richer in aroma volatiles of reducing nature, compared to non scented rice varieties. Carbonyl com-

Table 1. Alkaline oxidation values (AOV) of some rice varieties.

Rice variety	AOV$^{\omega}$	Nature of rice variety
Basmati[a]	4.4	Scented
Basmati[b]	4.0	Scented
Basmati[c]	4.4	Scented
Basmati-370[+]	2.4	Scented
Vadagaon-3-51-18	4.0	Scented
Vadgaon -4288	4.0	Scented
Improved Sabarmati[+]	1.6	Scented
Kalimuch	4.8	Scented
Saket 4	7.2	Non scented
Mashuri	5.6	Non scented
Karjat-14-7	5.6	Non scented
Ratna	6.4	Non scented
Pankaj	6.4	Non scented
Parimal	7.2	Non scented
Lakra	6.0	Non scented
Pusa 169[+]	6.0	Non scented
PR 106[+]	9.6	Non scented

$^{\omega}$Results average of three determinations
[a]from Punjab
[b]Commercial sample
[c]Export sample
[+]were one year old
All other samples were random samples.

pounds, alcohols, and reducing volatile aldehydes are the probable major contributors to the AOV [8]. The appreciable difference in the AOV of scented and non-scented rice varieties as observed in Table 1 suggested the possibility of using AOV as an indicator of adulteration of Basmati rice. Usually adulteration to the extend of 30-40 % is common. Therefore admixtures of Basmati 370 with three common cheaper adulterants viz Pusa 169, PR-106 and Improved Sabarmati were prepared in proportions of 60 : 40. All these rice were of the same age i.e. one year old, so as to eliminate the effect of aging on AOV, if any. Table 2 lists the AOV of pure Basmati 370, pure adulterants and the admixtures. The AOV of Pusa 169 was almost 3ce while that of PR 106 was about 4 times that of Basmati 370. On admixturing with Basmati, as expected, the AOVs were found to be increased compared to that of pure Basmati 370 alone. However, in case of Improved Sabarmati, which is also a cheaper but scented variety, the AOV was found

Table 2. [+]Effect of admixturing adulterants on AOV of Basmati — 370.

Basmati-370 100 %	2.4
Pusa-169 100 %	6.0
PR-106 100%	9.6
Improved Sabarmati 100 %	1.6
60 % Basmati-370 + 40 % Pusa 169	4.8
60 % Basmati-370 + 40 % PR 106	4.0
60 % Basmati-370 + 40 % Improved Sabarmati	1.8

[+]All rice samples were aged for one year.

to be lesser than that of Basmati 370 indicating that improved Sabarmati is richer in flavour volatiles than Basmati 370. The admixture had AOV lower than that of pure Basmati 370.

Thus, from these results it can be concluded that on adulteration with non-scented varieties, the AOV of Basmati 370 would increase, while admixture with scented variety like Improved Sabarmati would decrease the AOV. Further work is in progress to arrive at the exact alkaline oxidation value for pure Basmati.

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