ABSTRACT

Rice (*Oryza sativa* L.) is considered as staple food worldwide mainly in Asia and consumed after its dehulling, milling, and cooking. The Indian cultivars of rice grains for export are characterized on the basis of unique physicochemical and cooking features. Moreover, some cultivars of rice are highly aromatic and preferred over non-aromatic rice due to their distinct flavor caused due to the presence of volatile aroma compounds which vary significantly. The aroma strength with other biochemical and morphological characteristics *viz.* excellent evaluations of the milling, physical, chemical, cooking quality and organoleptic etc. makes difference in aspects of economical values. Keeping this in view, the present study was carried out to evaluate the physicochemical and cooking characteristics, proximate composition, mineral content, and fatty acids profile and also extract and identify the volatile aroma compounds from aromatic and non-aromatic rice cultivars. The results exhibited the higher hulling (80.82%) and milling (75.47%) of BSB whereas the highest head rice out-turns had in GVB (58.22%). KLN, KSB, SRB, and TDL had 6.16mm to 7.88mm kernel length been used to the preferred minimum acceptable standard of kernel length for Basmati rice (6.6mm). STG exhibited the highest kernel elongation ration after cooking and kernel elongation ratio were 2.20 and 2.07, respectively whereas non-aromatic rice TDL exhibited the highest volume elongation ratio (4.07). In addition, all aromatic cultivars were high in amylose content (more than 20%) and classified intermediate type as compared to aromatic rice KLN and non-aromatic SRB and TDL rice. The result of the proximate composition showed that GVB had the highest moisture (13.57%) and fat (0.92%) content, which signifies its taste attribute. BSB exhibited the highest fiber content (0.85%), carbohydrate content (82.70%) and food energy (365.23 kcal/g). Among the minerals, the higher Ca (98.75 mg/kg), Zn (17.00 mg/kg) and Fe (31.50 mg/kg) were in GBP, whereas Na (68.85 mg/kg) was in BSB, K (500.00 mg/kg) in STG, KSB and SRB. The unsaturated fatty acids *viz.* oleic acid (49.14%), linoleic acid (46.99%) and linolenic acid (1.27%) were found in SRB, whereas the highest content of saturated fatty acids viz. myristic acid (4.60%) and palmitic acid (31.91%) were found in GVB and stearic acid (6.47%) in TDL. The identified aromatic rice cultivars GPB, GVB and BSB and non-aromatic rice cultivar SRB were found nutritionally superior among all eight tested cultivars. Regarding the study of the volatile compounds, the solid-phase microextraction (SPME) and gas chromatography-mass spectrometry (GC–MS) were used to identify a total of 28 volatile aroma compounds which belong to the aldehyde, ketone, heterocyclic compound, alkane hydrocarbons, alkene hydrocarbon, aromatic other hydrocarbons, *N*-containing compound, and *S*-containing compound. There were **7** aldehydes (decanal. *e*-14-hexadecenal, heptanal, hexanal, nonanal, octanal and pentanal), 1 ketone **(**2-nonanone**)**, 1 heterocyclic compound (2-pentyl-furan), 9 alkane hydrocarbons (2,6,10-trimethyl-pentadecane, dodecane, eicosane, heptadecane, hexadecane, octadecane, pentadecane, tetradecane and tridecane), 1 alkene hydrocarbon (undecane), 5 aromatic hydrocarbon (toluene, 1,3-dimethyl-benzene [other name: m-xylene], 1,3,5-trimethyl-benzene, 1,3-diethyl-benzene and 2,6-dimethyl-naphthalene), 2 other hydrocarbons (2,6,10-trimethyl-dodecane and 4,6-dimethyl-dodecane), 1 nitrogen-containing compound (2-acetyl-1-pyrroline) and 1 sulphur-containing compound (dimethyl disulphide). 2-acetyl-1-pyrroline (2-AP) is the single aroma compound found in all rice cultivars (0.01-0.11 %) and is the main aroma compound of scented rice, used to differentiate between aromatic and non-aromatic rice. Thus, all aromatic and non-aromatic rice cultivars had grain quality characteristics with minimum acceptable standards for the breeding of basmati type cultivars which may use for breeding quality and graded as export quality rice with good unique nutritional values in the international market. The HS-SPME/GC-MS was found to be superior method over the other conventional method for studying the volatile aromatic compounds in rice and will be helpful in presenting new ideas for all those scientists, researchers, academicians and industrial peoples who have an association with rice aroma and work for their improvement and development in rice.

Keywords: Aromatic rice, Physical characteristic, Milling characteristic, Cooking characteristic, Proximate composition, Nutritional quality, Rice aroma, 2-acetyl-1-pyrroline (2-AP), Extraction method, Solid-phase microextraction (SPME), Gas chromatography-mass spectrometry (GC-MS)