

ABSTRACT

Rice (*Oryza sativa* L.) is a staple food consumed worldwide. Some rice cultivars are preferred over others due to their distinctive aroma which contributes to consumer acceptability and increased economic importance. New Rice for Africa (NERICA) is an inter-specific high yielding upland variety, which is a promising crop for addressing food insecurity in Africa. NERICA 1, 4 and 10 were released to farmers in Kenya for cultivation in 2009. Although studies have shown variations in NERICA yield due to environmental factors such as soil and weather patterns, there is no information on their influence on volatile flavor compounds (VFCs), hence aroma quality. Some NERICA varieties are said to possess more fragrance but the constituents contributing to aroma have not been identified. Indeed, it is not documented if different varieties produce varying aroma complexes. Nitrogen (N) fertilizers are applied to increase crop yields, accompanied by changes in composition of plant secondary metabolites. Despite changes in environmental parameters and N-rates, it is not documented how NERICA varies in growth and quality in Lake Victoria basin. The objective of this study was to investigate agronomic performance and composition of VFCs of cooked NERICA 1, 4 and 10 and their variations due to location of production and nitrogen fertilizer rates. The experiments were set up at KALRO farms in Kibos, Oyani, and Maseno University Botanic garden in a split plot design with three NERICA varieties (sub plots) and four nitrogen fertilizer levels (20, 60, 100 and 140 KgN/ha as main plots) replicated three times. Field data obtained included plant height, number of tillers and leaf chlorophyll content. Grains were harvested at maturity, sun-dried for seven days, de-hulled and milled. The VFCs were extracted using Licken-Nickerson distillation method; quantified using Gas Chromatography with ethyl decanoate as an internal standard and identified by Gas Chromatography Mass Spectrometry. Agronomic performance was influenced by varietal differences and geographical location of production. Significant ($p \leq 0.05$) differences were observed in leaf chlorophyll content of at different locations, while tillering did not vary. Plant height numerically increased with increased N-rates with NERICA 4 at Kibos being significantly ($p \leq 0.05$) taller than at Maseno and Oyani due to favourable soil parameters. Kibos site at N-rate 140 KgN/ha was most suitable for growth parameters, while NERICA 4 had highest growth parameters at all sites. A total of 110, 100, and 100 VFCs were detected in NERICA 1, 4 and 10, respectively. NERICA 1 had better quality in terms of VFCs concentration. Classes of aroma compounds detected were green leaf volatiles, terpenes and aromatics. The main aroma compound 2-acetyl-1-pyrroline was detected in NERICA 1 from Oyani and Maseno at 60 KgN/ha and 100 KgN/ha, respectively. NERICA 1 was more fragrant due to the presence of 2AP, while NERICA 4 and 10 lacked 2AP. Maximum VFCs occur at N-rates 60 to 100 KgN/ha. NERICA 4 is recommended for cultivation at Kibos site under N-rates 140 KgN/ha for maximum yield, while fragrant rice should be cultivated at Maseno and Oyani within N-rates 60 to 100 KgN/ha.