A PRELIMINARY INVESTIGATION ON THE PRODUCTION OF RED PIGMENTS BY *Monascus purpureus* ON SRI LANKAN YAMS, TUBERS AND RICE VARIETIES

by

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ABSTRACT

The fungus *Monascus purpureus* responsible for the coloration of "Ank kak" (Chinese red rice) was originally grown in China. It was used in cottage industry on Solid Substrate Fermentation for thousands of years for coloring rice, wine and other native foods.

This color additive is a combination of six related pigments of red, orange and yellow, two of each. The red pigments are known to be derived from the orange. The production of red pigments depends on the cultural conditions provided.

Monascus red pigments, concluded safe by the Japanese National Research Institute in (1973-75) have caused considerable attention for use in food, beverage and cosmetic industries.

The current study investigated various starch substrates available in Sri Lanka, the different processing conditions and cultural conditions required for the growth and production of red pigments by *Monascus purpureus.*

The fungus, grown on starch substrates with a Nitrogen source, incubated for 14 - 21 days resulted in a fermented substrate deep red in color. It was dried and powdered and was subsequently extracted into 65% Ethanol.

Current study revealed that, with the increase in the concentration of N-source (NH_4NO_3 & soya meal) from 0.2 - 4.0% w/w, an increase in the production of scarlet red pigments by *Monascus purpureus* occurred in white rice, red rice, and cassava. The extension of the incubation period from 14 to 21 days also enhanced the production of red pigments. White rice gave the highest yield of pigments (of both red and orange pigments) with NH_4NO_3 at 1.4% w/w concentration. Pigment production was 3498.6

pigment units. Red rice was found to enhance the formation of red pigments. The highest red/orange ratio ($\lambda_{500/470}$) of 1.66 was obtained on red rice-soya meal test cultures. Soya meal enhanced the production of red pigments with high $\lambda_{500/470}$ ratios. NH_4NO_3 as N-source gave a higher production of pigments. White rice-NH_4Cl test cultures produced deep scarlet red pigments by *M. purpureus* at a concentration of 0.4 % w/w.

Fermented test cultures of white rice, at a soya meal concentration of 1.4% or 3.0% at p^H - 4.0 obtained deep red pigments on incubation for 21 days at room temperature. Red rice at similar conditions with 1.2% or 1.4% of soya meal, also yielded deep scarlet red pigments. And cassava, with 1.4% or 2.5% soya meal, (p^H- 4.0), at similar conditions as above produced deep scarlet red pigments.

The fungus also yielded deep red pigments with NH_4NO_3 used as N-source with white rice, red rice, and cassava. White rice-NH_4NO_3 fermented test cultures at NH_4NO_3 concentrations 2.0% and 3.0%, (p^H-6.5) and red rice-NH_4NO_3 at concentrations of 0.8%, 1.4% and 3.0%, (p^H - 6.5) and dried, sterilized/cooked cassava at NH_4NO_3 concentrations 0.8 %, 1.4% (p^H - 6.5) with added nutrients Zn^{2+} and Mn^{2+} after 21 days of incubation yielded scarlet red pigments.

In submerged cultures *M. purpureus* produced red pigments with Cassava (*Manihot esculenta*) Hingurala (*Dioscorea alata*) and Kiriala (*Colocacea esculenta*).

Sri Lankan, white polished rice and red rice are suitable starchy substrates for the pigment production by *Monascus purpureus*. Cassava was found to be a suitable cheap C-source for *Monascus* pigmentation.

Soya meal, NH_4NO_3 and NH_4Cl are suitable N-sources for *Monascus* pigment production at the initial p^H of 4.0, 6.5, and 6.5 respectively.