Proceedings of the

NATIONAL CONFERENCE ON MULTIDISCIPLINARY RESEARCH

VIRTUAL 2020 POSTGRADUATE SYMPOSIUM

"Inspiring Sri Lankan Youth for Tomorrow's Science"

NCMR 2020

08th October 2020

ORGANIZED BY THE YOUNG SCIENTISTS' ASSOCIATION, NATIONAL INSTITUTE OF FUNDAMENTAL STUDIES, SRI LANKA

NIFS

NIFS-YSA

Main Sponsor: BANK OF CEYLON BOC Bankers to the Nation

ISSN 2756-9063
Proceedings of the National Conference on Multidisciplinary Research-2020
Young Scientists' Association, National Institute of Fundamental Studies, Sri Lanka October 08, 2020

Fine mapping of grain zinc using synchrotron-based XFM revealed genetic variation in grain Zn distribution in wheat cultivars

L.C.J. Kamaral[1], S. Neate[1], D.J. Paterson[2], P.M. Kopittke[3], T.M. Rajaratne[4], S. Seneweera[1, 4*]

[1]*Centre for Crop Health, University of Southern Queensland, Toowoomba, Queensland, 4350, Australia*
[2]*Australian Synchrotron, ANSTO, Clayton, Victoria 3168, Australia*
[3]*School of Agriculture and Food Sciences, The University of Queensland, St Lucia, Queensland, 4072, Australia*
[4]*National Institute of Fundamental Studies, Hanthana Road, Kandy, 20000, Sri Lanka*

[*]*saman.se@nifs.ac.lk*

Zinc (Zn) is an important micronutrient in human nutrition, where it regulates growth and development. Accordingly, an inadequate dietary intake of Zn causes a range of health-related complications. The people at most risk of Zn deficiency are those who depend upon wheat, with this having a low Zn concentration and poor bioavailability. However, there is considerable variation in grain Zn among wheat cultivars, and we hypothesize that the major bottleneck for Zn biofortification is linked to Zn loading and spatial variation in accumulation in the grain. To test this hypothesis, mapping of grain Zn was carried out using synchrotron-based X-ray fluorescence microscopy (XFM) with two genetically contrasting wheat cultivars, PBW343 (Zn efficient) and Goldmark (Zn inefficient). We obtained longitudinal and transverse sections (80 μm thickness) from mature grains. The elemental distribution within the wheat grain sections was examined *in situ* using XFM beamline at the Australian Synchrotron. A double Si (111) crystal monochromator was used to select a monochromatic beam of 18.5 keV X-rays, which was focused (2.0 μm × 2.0 μm) using Kirkpatrick–Baez mirrors. The XFM signal was collected using a 384-element Maia detector, and raw XFM data were analyzed using GeoPIXE software. Our results demonstrated that most of the Zn were localized in the seed embryo of Zn efficient PBW343 (170 mg kg^{-1}) compared to Zn inefficient Goldmark (130 mg kg^{-1}). Further, the highest embryonic Zn was located in shoot primordium and root primordium, whilst the highest Zn was in the shoot primordium. The highest shoot primordium Zn concentration was observed in PBW343. These findings suggest that embryonic Zn concentration is likely to play as a physiological marker that can be used for future Zn biofortification in wheat.

Keywords*: zinc, wheat, synchrotron based XFM, embryo*

NIFS-YSA
NCMR-2020

National Conference on Multidisciplinary Research

ISSN 2756-9063