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Crispr: A Revolutionary Gene-Editing Technology

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ABSTRACT

With the changing environmental conditions, we are facing a big challenge to our global food security. This situation clearly questions our conventional production technology and thus there is an increasing need to modify or improve the current crop production practices. In this regard, Biotechnology emerges as a very essential tool. A new revolutionary technology, CRISPR i.e. Clustered Regularly Interspaced Short Palindromic Repeats has emerged as an advanced approach. This technology catches the attention of the breeders due to its targeted and precise technique of creating genetic variability. Under this, different CRISPR enzymes can be employed to undergo varied gene editing like editing a gene to promote disease resistance, nucleotide editing for herbicide resistance etc. The existing Recombinant DNA technology is at a slow pace as it takes time for its approval by the regulatory committee. On the other hand, CRISPR can flourish in the market in less time as it do not contain any foreign DNA unlike the genetically modified ones. CRISPR has been applied to many horticultural crops. In tomato, CRISPR is used widely to induce resistance to biotic stress like tomato yellow leaf curl virus, downy mildew, powdery mildew, tobacco mosaic virus and grey mould disease and also used to improve fruit quality and in development of parthenocarpic fruits. Apart from this, it was also applied in citrus, grape, papaya, watermelon, kiwifruit, cucumber, groundcherry etc. Virus resistance has been induced in non-transgenic cucumber by disruption of the recessive eIF4E (eukaryotic translation initiation factor 4E) gene. Therefore, CRISPR/Cas9 technology can be seen as a versatile, low-cost and powerful tool having various targeted applications in horticultural crops.

Keywords: Biotechnology, variability, recombinant, resistance, parthenocarpic, transgenic.

Enhancement of Zinc and Iron Availability of Peanut by Reduction of Phytic Acid Content Using Processing Techniques

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Abstract

Peanut seed has two-three times more Zinc (Zn) and Iron (Fe) content than cereals and is a good source of micronutrients. But the high phytate acid which is an anti-nutrient may be a bottleneck in making these micronutrients available for consumption. Thus a study was conducted to observe changes in the phytic acid, Zn and Fe content during different processing techniques like soaking (8 h and 16 h), roasting and microwave (MW) irradiation. Seeds from ten popular peanut varieties were soaked in water (2:1 ratio) for 8 and 16 h at room temperature, roasted at 160°C for 12 min and irradiated by MW for 3 min at 900W. Moisture, phytic acid, Zn and Fe content were determined in raw, roasted, water-soaked and MW-irradiated samples. Seed soaking for 8 h caused a significant reduction in phytic acid (23-68%) content followed by MW irradiation and roasting as compared to raw samples. However, extending soaking for 16 h could not reduce phytic acid content when compared to 8 h soaking. Water soaking might have triggered phytase enzyme in seeds which has resulted in reduction of phytic acid. Zn and Fe content in all treated samples were negatively correlated with phytic acid content. This study has clearly demonstrated that water soaking reduces phytic acid and was a better processing technique than roasting and MW-irradiation. The results propose the benefits of soaking treatment as a possible alternative and processing technique for reducing phytic acid and improving mineral (Zinc and Iron) content which can potentially help in alleviating emerging problem of malnutrition.

Keywords: Peanut, phytic acid, zinc, iron, roasting, soaking, microwave (MW) irradiation