

# **BIOiChar: Biochar-Based Organic Fertilizer**

Theeba Manickam, Ilani Zuraihah Ibrahim and Nor Fadhilah Abdul Halim

Soil Science Research Centre, MARDI

In general, organic fertilizers have low nutrient content. Solid organic fertilizers such as compost and manures have slow release rates, requiring soil microorganism to break down the materials into chemical forms that plants can use. Approximately only half or less of the nutrients are released for crop use and others are lost through various mechanisms in the field. This causes the farmers to use organic fertilizers in significantly larger quantity especially for fruit vegetable crops which require sufficient potassium and phosphorus nutrients for high yield production. Apart from that, current organic fertilizers found in the market with high nutrient rates are uncertain of their organic status and resources which are required by MyOrganic guidelines. Malaysia is importing organic fertilizers in high volume to cater to the needs of high yield crop production and certify organic sources. To overcome these constraints, an environmentally friendly, highly efficient and cost effective solid organic fertilizer, 'BIORiCHAR', was developed to achieve better crop production through higher nutrient supply and retention for more efficient crop uptake under organic farming system. In addition, the fertilizer was developed following the list of materials allowed by MyOrganic guidelines.

'BIORiCHAR' was developed through a composting process using a combination of rice husk and empty fruit bunch biochars with selected high nutrient substrates and enhanced with effective microbes, zeolite and plant enzymes. Biochar which is used as a fertilizer base has many advantages such as high pH, water holding capacity, absorption and nutrient holding capacity and acts as a microbial carrier which enhances crop growth and yield production. Biochar addition in the developed organic fertilizer, functions mainly to hold the nutrients inside the macro and microspores and will release them slowly in the soil with the presence of water. It was found that composting process of nutrient substrates was accelerated by the addition of biochar through the increase in microbial population and shorter maturity period. Moisture content in the compost with biochar was found higher throughout the composting period as compared to compost without biochar. This helps in reducing compost leachates. Laboratory leaching test and field verification of the developed organic fertilizer showed significantly lesser leaching rates (10-15%) when compared to compost without biochar. Addition of biochar also resulted in higher and more sustainable crop yield production (15-20%) compared to current fertilizer practice. High surface area of biochar also helps to improve soil structure in relation to porosity (5%) after repeated applications of fertilizer in the field.

'BIORiCHAR', which has lesser leaching rates, provides more available nutrient sources for crop uptake in the soil. Sufficient amount of NPK, especially for fruit vegetable crops, will be delivered to the crops in a more efficient way. Long term application of the fertilizer is expected to improve soil physico-chemical properties such as pH, porosity and water holding capacity as well as soil microbial properties.

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