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Development of rapid, low cost and in-field sulphur determination method

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Abstract Sulphur (S) deficiency of soil has been recognized as a constraint to sustainable crop production in the world, especially in Southeast Asia including Bangladesh. Standard laboratory methods are available to determine available S in soils, but no rapid, low cost, reliable and farmer friendly S determination method is available. Hence a study was conducted at Bangladesh Agricultural University (BAU), Mymensingh towards that end. The principle of S determination is barium is precipitated as $BaSO_4$ when $BaCl_2$ is added to SO_4^{2-} containing solution or soil extractact. This precipitation is proportional to SO_4^{2-} concentration in the solution or extract. In this method, soil S concentration is determined colorimetrically with eye estimation by using a novel protocol instead of costly spectrophotometer. This rapid method was validated against standard S determination method by using a set of 70 paddy soils collected from across Bangladesh. The validation test showed that S content as measured by rapid test matched well with the standard lab measurement representing an accuracy of 80%. For further validation, the developed rapid method was tested in field condition in the rice (var. BRRI dhan28) – rice (var.BRRI dhan49) cropping pattern at three locations of Bangladesh covering three AEZs viz. Old Brahmaputra Floodplain(AEZ 9), Old Meghna Estuarine Floodplain(AEZ 19) and Madhupur Tract(AEZ 28). The treatments were :(i) Standard laboratory test based S fertilization,(ii) Rapid test based S fertilization, (iii) Farmer's S fertilization,(iv) Fertilizer Recommendation Guide based S fertilization and (v) Control (no S application). Raid method based S fertilization performed similarly with the standard lab and FRG based S fertilizations, with no significant differences but it showed a significant difference with the farmer's practice and control treatments. Hence, the developed rapid soil testing kit method would be useful for the farmers to maintain S fertilization for achieving the maximum crop yield.

Keywords Sulphur, Rapid determination, Paddy soil