IRJSE International Research Journal of Science & Engineering *Int. Res. J. of Science & Engineering,* 2017; Special Issue A1 : 189-191 SJIF Impact Factor 4.11
ISSN: 2322-0015 UGC Approved Journal No. 63628
RESEARCH ARTICLE **OPEN ACCESS**

Sea Shell Derived $CaCo_3$ Nanorods as Calcium Rich Fertilizer in Agriculture

Dhakane SF[1] and Moulavi MH[2]

[1]Department of Physics, A. W. College, Otur, Tal-Junnar, Pune 412 409, MS, India, [2]Department of Chemistry, A. W. College, Otur, Tal-Junnar, Pune 412 409, MS, India, [3]Vice Chancellor, SRTM University, Nanded, MS, India
E-mail: dhakanesf@gmail.com

Manuscript Details
Available online on http://www.irjse.in
ISSN: 2322-0015

Editor: Dr. Arvind Chavhan

Cite this article as:
Dhakane SF and Moulavi MH. Sea Shell Derived $CaCo_3$ Nanorods as Calcium Rich Fertilizer in Agriculture, *Int. Res. Journal of Science & Engineering,* December 2017; Special Issue A1 : 189-191.

ABSTRACT

Recently irrigated land was salty due to excess use of water and fertilizers. Sea shells are around sixteen trace elements, growth hormones and nutrients and many more fungal diseases to preventatives, soil imbalance such as a deficiency of nutrients will be correlated. For that we would collect sea shell from Murud beach it was dried, powdered and characterized by XRD and FESEM Technique. The XRD shows formation of 200 nm crystal phase with crystallized size 40 nm. FESEM shows $CaCO_3$ nanorods with 200 nm are embedded between protein threads and covers. Study calcium present in soil profile supplemented by physical, chemical and biological properties of soil will give full picture of soil fertility and productivity. With this kind of awareness the present study shows that the growth of plant was higher when sea shell fertilizer was applied rather than inorganic fertilizer similarly fluorescence efficiency and Chlorophyll contents are also improved due to the application of sea shell fertilizer.

Keywords: XRD and FESEM Technique, $CaCO_3$ Nanorods, Sea Shell

INTRODUCTION

Agriculture refers to an art of raising plants from the soils and is one of the most important and an economical factor for human being. Calcium as nutrients not only increases the uptake of other nutrients but also maintains the balance of nutrient uptake [1].

Plant requires soil nutrients for their growth, deficiency in a plant observe adverse effect. Calcium helps to promote favorable soil structure. Calcium is necessary for proper cell division and cell wall development in plants as well as enzyme activity and starch metabolism [2]. The various physiological and metabolic functions of plants are related with Ca-uptake viz. carbohydrate metabolism, growth and reproductive functions. But due to abnormal conditions of soil, by virtue excessive irrigation, unscientific use of fertilizers, alkaline nature of soil increases so Ca leaches out. The unavailability of Ca, the structure and texture and hence fertility of soil decreases. So it requires the applications of Ca fertilizers [3]. The unawareness one will maintain Calcium level for proper yield and economy of the production and for this reason of Ca application among the farmer society of Junnar Tahsil is main reason for unavailable Ca in soil. Soil contains Ca mainly in the form of $CaCO_3$. Other commercial sources of Ca fertilizers are no affordable for farmer society so farmers avoid the applications of commercial fertilizers [4]. This approach will supply the Ca-rich fertilizers and generate the employments in Indian farmer society.

The lining of 7500 km sea coast for India is natural heritage in respect of huge amount of $CaCO_3$ for agriculture and other sources. Poultry bird egg shell waste can be a cheap source of $CaCO_3$ in agriculture.

METHODOLOGY

Materials in sea shell are dried and filterd powdered in mortars and pestle [5]. From this powdered materials, Ca foliar spray and Ca fertilizers are prepared and characterized by XRD and FESEM Analysis. X-ray diffraction (XRD) analysis of the synthesized material was carried out using Bruker AXS model D-8, (10 to 90° range, scan rate =1° min^{-1}) equipped with a monochromatic and Ni-filtered Cu Kα radiation [6]. SEM analysis was used to determine particle morphology of the desired powder catalysts using HITACHI S-4800 model. Both Ca rich foliar spray and Ca fertilized are analyzed for soluble Ca by EDTA titration method [7, 8].

A) Preparation of Ca foliar spray: 10 g sea shell powder is submerged in 1 liter water and it is held for one month undisturbed, 10 ml sample is analyzed for soluble Ca

B) Preparation of Ca fertilizer: The 10 g sea shell powder is added in 1 kg dry soil in a pot and it is irrigated per week for one month. The 10 g this Ca-rich soil sample is analyzed for soluble Ca content by EDTA method.

C) Determination of soluble Ca by EDTA method 10 ml Ca rich foliar spray is diluted to 100 ml. 10 ml aliquot sample is titrated with 0.01 M EDTA solution by erichrome black -T indicator. Reading are corrected after blank and back titration

D) Determination of soluble Ca in soil sample: To 10 gm soil sample 100 ml water is added stirred for 1 hr and filtered. 10 ml aliquot of soil solution is titrated with 0.01 M EDTA solution using erichrome black-T indicator. The readings are corrected after back and blank titration.

E) This Ca powder spray was applied in field plants like wheat, Fenugreek and onion and observes plant fluorescence, chlorophyll and photosynthetic efficiency.

RESULT AND DISCUSSION

XRD study:

The sea shell derived $CaCO_3$ powdered samples are characterized by XRD study.

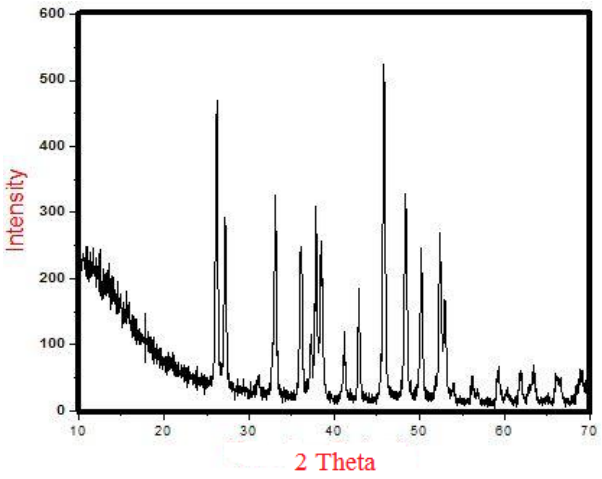

Fig.1 The XRD spectra of $CaCO_3$

Table 1: Treatedand untreated plant

Sr. No.	Wheat		Fenugreek		Onion	
	Untreated	Treated	Untreated	Treated	Untreated	Treated
Chlorophyll (gm/lit)	0.0499	0.0998	0.0077	0.02167	0.00027	0.00089
Fluorescence	0.721	0,811	0.761	0.806	0.809	0.824
Weight(gm)	49.99	73.86	21.15	32.05	54.58	61.78

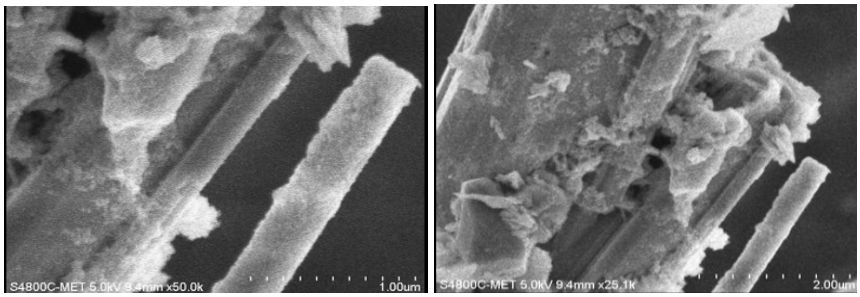

Fig. 3 The FESEM Analysis of powdered sea shell samples

FESEM STUDY

The Analysis of powdered sea shell powder by FE-SEM study shows the presence of $CaCO_3$ nanorods tied by protein sheath with each other. The average thickness of this rod is 100-200 nm.

CONCLUSION

The application of sea shell fertilizer in plant fluorescence, chlorophyll and photosynthetic efficiency results have indicated that the growth of sea shell treated plants was higher than that of untreated plant that means improves the photosynthetic efficiency of plant shifting redox potential of Q_b towards Qa and hence it favors forward flow of electrons as compared to the untreated plants. Thus it improves PS-II of the photosynthetic apparatus more efficient as compared to PS-I due to the application of biofertilizer as a sea shell. The XRD shows formation of 200 nm crystal phase with crystallized size 40nm. FESEM shows $CaCO_3$ nanorods with 200 nm are embedded between protein threads and covers

REFERENCES

1. Bassi R *et al*. "Regulation of photosynthetic light harvesting involves intrathylakoid lumen pH sensing by the PsbS protein". Journal of Biology Chemistry. 2004;**279** (22): 22866–22874.
2. Wagh GS, Sayyad MRG. Assessment of Macro and micronutrients in soils from Panwel area Maharashtra India. *Universal J. of Environmental Research and technology* 21013; 3:72-78.
3. Hammann M, Junge W. Photosynthetic water oxidation: a simple X-scheme of its partial reactions, *Biochim Biophysics Acta* 1999; 1411: 86-91.
4. Gael Lebon. Photosynthesis of the grapevine (*Vitis vinifera*) inflorescence,Tree Physiology, Heron Publishing-Victoria, Canada, 2005;25:633–639
5. Lichtenthaler HK. Chlorophylls and Carotenoids: Pigments of photosynthetic biomembranes", Methods Enzymol, 1987:148:350–382.
6. Arono FS. Photochemical reduction of chloroplast grana, *Plant Physiology*, 1946;21:393-409.
7. Heinrich G, Krause, Weis Engelbert. Chlorophyll Fluorescence as a tool in plant physiology-II Interpretation of fluorescence signals, Photosynthetic Research. 1984; 5:139-157.
8. Alexandria stirbeta A, Govindjee B. On the relation between the Kautsky effect (chlorophyll a fluorescence induction) and Photosystem II: Basics and applications of the OJIP fluorescence transient", *Journal of Photochemistry and Photobiology* B: Biology, 2011;1010:1010-1011.