International Journal of Advanced Science and Research
ISSN: 2455-4227
Impact Factor: RJIF 5.12
www.allsciencejournal.com
Volume 3; Issue 6; November 2018; Page No. 33-35

The semi-natural modelling *Sesbania grandiflora* and *Rhizobium florundica* in fish-growth and reproduction by means of symbiotic process nitrogen fixation to nitrate (NO_3^{-1}) supplementation in inland-waters

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Abstract
Sesbania grandiflora a terrestrial plant may be the God gifted and very scientific plant species and this may help in inland-fisheries in according to seasonal nitrogen demand. *Sesbania grandiflora* and associated *Rhizobium florundica*, in a new synthetic Ecology. These may help in fish-growth and reproduction by means of symbiotic process of fixing nitrogen to Nitrate (NO_3^{-1}) and provide supplementation through leaching from fisheries surrounding uplands specially in tropical climate. Other plants species *Aeschynomene aspera*, *A indica* the submerged species may also helping in fisheries as nitrogen demands in fisheries comes through different symbiotic nitrogen fixation may take place in their stems.

Keywords: growth modelling, *Sesbania grandiflora*, *Rhizobium florandica*, Sustainable fisheries and agriculture

Introduction

Sesbania grandiflora (Fig 1, 2) is a fast-growing tree the growth modelling of Rhizobium and this plant are being described. This plant is having leaves that are regular and rounded and the flowers white or red. The fruits look like flat, long, thin green beans. The tree thrives under full exposure to sunshine and is extremely frost sensitive. It is a small soft wooded tree up to 3–8 m tall. Leaves are 15–30 cm long, with leaflets in 10–20 pairs or more and an odd one. Flowers are oblong, 1.5–10 cm long in lax, 2–4 flower racemes. The calyx is campanulate and shallowly 2-lipped. Pods are slender, falcate or straight, and 30–45 cm long, with a thick suture and approximately 30 seeds 8 mm in size.

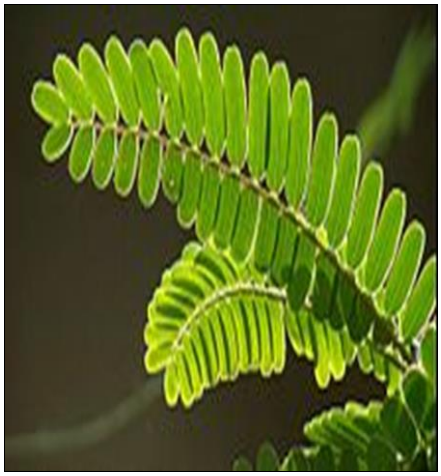

Fig 1: A leaves of *S. grandiflora*

Fig 2: Flowers of *S. grandiflora*

Fig 3: *Sesbania* growth and bi-seasonal flowering having a truncated Normal-Distribution

This plant is with great utility in fisheries. Even if fisheries is being practised either naturally, semi naturally or culturally is primarily owing to obtain a high protein demand on day-to-day basis. Although major purpose of fisheries is to clean a pollutant waters, to create a healthy eco-system, beautification, ornamental and may be aesthetic as well. Fishes to grow need a high sources of nitrogen that comes from the water environments. All known that in tropical air around 78 % by volume contains Nitrogen. This nitrogen inducted cycle may have a vital role in fisheries. In surrounding Inland fisheries, this may be an induction process in fixing atmospheric nitrogen to assimilate in root nodules of this terrestrial plant viz. *Sesbania grandiflora.* Nitrate may come to environment through leaching or seepage and this

process may called as 'nitrate-fisheries' in tropical ecology. Symbiotic bacterium associated in this nitrogen fixing process is *Rhizobium florundica.* This is may exist in a new synthetic semi environmental condition of tropical climate of West Bengal or elsewhere in other part of tropical regions. Observed that Nitrogen fixation may be minimum during the summer months or pre monsoon and gradually increasing till spring season. This is hypothesized with observation that a significant part (0.6) of total fixing nitrogen in nodule may help in physiological growth of *Sesbania grandiflora*, a tropical terrestrial plant. Other (0.4) may add to spoil and fisheries waters through leaching. Beside nitrogen fixation *Sesbania grandiflora* is flowering plant and this flowers may a market values owing to have dietary and medicinal.

Materials and method

Data are being collected for compilation, interpretation and presentation (Fig 3, 4, 5) are made using spread sheet software MS-Excel. Growth model of *Rhizobium florandica* may be found Logarithmic whereas the growth model of *Sesbania grandiflora* is found either growth or power which are may be more significant. It is also noted that atmospheric nitrogen-fixation is environmental and has definite relation proportionate with semi-mature to mature stem length with number of flowers and around the years which may be mainly a truncated normal distribution. This plant has got double flowering seasons viz autumn and spring. Season with low to moderate temperature may produce more number of flowers. Other statistical observations related to nitrogen fixation of this plant and ultimately to the fisheries lowland may proportionate to fish growth phases, starting from egg laying period minimum fixation to juvenile period when there is maximum nitrogen assimilation.

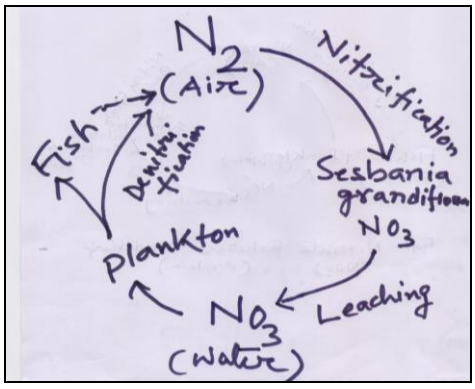

Fig 3: Diagram of Nitrate in-Fisheries through symbiotic fixation with *Sesbania grandiflora* & *Rhizobium florundica* (Proposed by this same Author).

Results and discussion

According to the annual known physiological and reproductive growths the most species *Sesbania grandiflora* may help in supplementation of nitrate in inland fisheries. Consequently nitrogenous nodule formation is maximum during the spring season when most fish species in tropic may need more precursor or bio-molecule viz. NO_3 required for protein synthesis in fish-body of course under a semi-natural system as radical Nitrate is circulated through leaching to water accordingly to plankton and hence to fishes. Known that tropical agriculture is vulnerable owing to prevailing high temperature and inadequate soil-moisture. This growth model of *Sesbamia grandiflora* in the upland of fisheries surrounding may be doubling an insurance to the farming community through its valued flowerings in seasons viz. pre winter and post winter. As stated this plant has got some *Ayurvedic* importance owing to its compositional values and further may become popular in tropical climate. Author has found that flowering capacity of this plant species may be multiplied in the uplands of fisheries surrounding.

Conclusion

Sesbania grandiflora in fisheries upland utility to support natural beautification and occasional livelihood as this plant produce profuse flowers, twice in a year. These have been observed that a tropical plant namely *Sesbania grandiflora*, a free-atmospheric nitrogen-fixing plant may grow well on the upland of fisheries-peripherals. This plant has got usual 'Growth-model' with annual bio-mass capacity starting from 1kg to 500 kg/plant depending on plant-canopy index / LAIs, this may relate to the soil and environmental factors. A proportionate (0-.6) amount of total nitrogen may come from atmospheric nitrogen, remaining proportion of fixing nitrogen (up-to 0.4) may help in soil, soil waters, in plankton growth and hence may be in inland-fisheries. Annual growth-rate of symbiotic Bacteria namely as identified, *Rhizobium florandica* and nitrate (NO_3^{-1}) containing in nodules, however may found Logarithmic with a ranged value (0-2) kg Nitrogen per/year/ symbiotic plant. The patterns of Bacterial-growth is maximized during the Spring and with a fall in summer season, this plant might have got an unique of nutritional requirements in relation to major source of Nitrogen(N) containing matters while most fishes to breed, naturally. Also, this non-traditional terrestrial plant, *Sesbania grandiflora* has a bi-seasonal profusely flowering capacity locally considered as vegetarian and ayurvedic diet. Most Honey-bees species are being attracted by this flowers if remain un plugged. Naturally seed formation per pod is ranging from lying in the range of 0-10. *Sesbania grandiflora* has a comparatively more than or than average vegetative growth and foliage may help to from manure helping plankton growth as well.

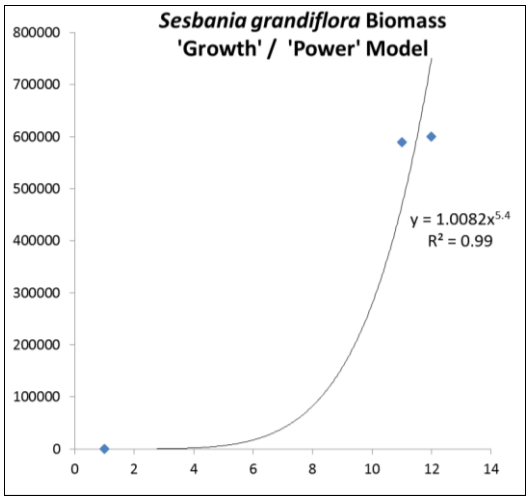

Fig 4: Physiological Growth Model of *Sesbania grandiflora*

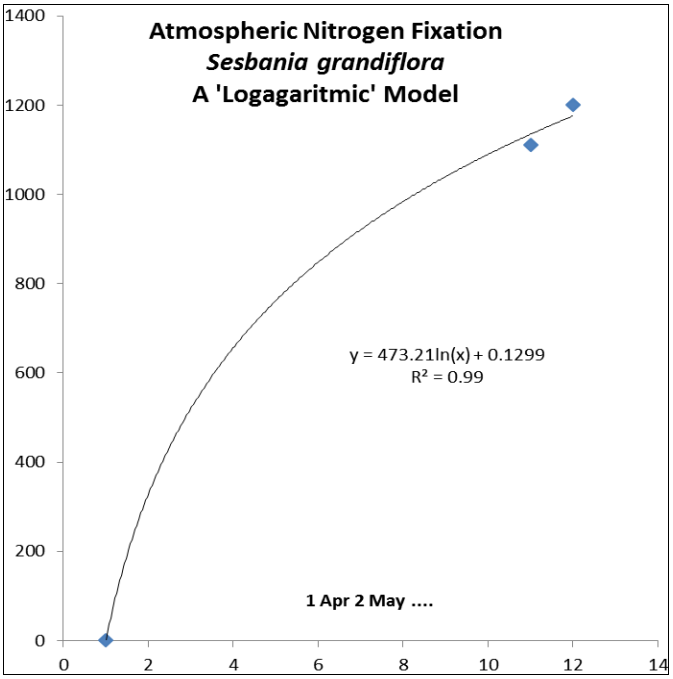

Fig 5: Atmospheric Nitrogen fixation Model of *Rhizobium florandica*

A single plant of *Sesbania grandiflora* on optimal condition, which prevails surrounding fisheries peripheral or upland can produce more than thousand flowers in a every season and this flowers are considered as vegetable among local people. Although this plant is not become so popular among all, owing to the engagement every day-to-day attention to harvest flowers for a prolonged many days which is in contrary to other agricultural harvests of crops. Once we correlate this plant with fisheries this may become to provide a worthy natural sustenance in relation to supply nitrate to water of inland fisheries as described, eco-sensibly

References

1. https://en.wikipedia.org/wiki/Glycation