It could be seen that majority of the extension workers wanted to acquire skill in the areas like seed production technologies for various crops, use of bio-pesticides and production and use of bio-fertilizers.

These areas were of complex in nature and thus they wanted to improve their ability in the preparation of different products of these areas.

Conclusion

It was concluded from the study that the Agricultural Officers gave primary preferences for skill oriented training in subject matter areas of farm and crop management aspects, agronomical aspects, allied enterprises and extension education, particularly in the following areas such as preparation and use of audio visual aids, extension teaching methods, processing of the products of commercial crops, olericulture, apiculture, land preparation, harvesting, post harvest technologies, integrated farming system, seed production technologies for various crop and use of bio-pesticides.

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ASSESSING THE PERFORMANCE OF *Azolla microphylla* IN DIFFERENT NON-SUPPLEMENTED SOIL SERIES SAMPLES

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ABSTRACT

Among the different species of *Azolla*, *Azolla microphylla* performs well at this Cauvery Delta Zone (CDZ). An experiment initiated with an objective to assess the biomass production of *Azolla microphylla* in different soil series over weekly intervals revealed that the capacity of soil irrespective of soil series to buttress the growth of *A. microphylla* is only upto 23 weeks from the date of inoculation. Among the four soil series tested (Kalathur, Adhanur, Padugai and Alangudi), Kalathur series had supported higher biomass production owing to the medium P status.

KEY WORDS: *Azolla microphylla*, Biomass production, Soil series.

Azolla sp. a floating water fern helps in fixing the atmospheric Nitrogen through its symbiotic relationship with the alga *Anabaena azolla*. Nitrogen fixation and conservation by Azolla which is an ideal biological system for increasing rice grain yield under low-cost rice production technology has been well documented (Kannaiyan, 1987). Excretion of Ammonia in the water after its addition and its increase with the incorporation has been well studied (Lakshmanan *et al.*, 1997). Among the different species of *Azolla*, *Azolla microphylla* performs well in the CDZ due to its tolerance for higher temperature and relatively shorter multiplication period. Hence, a study was undertaken to assess the performance of *Azolla microphylla* in different soil series representing the CDZ and to find out the time upto which the soil can supply the native nutrients for economic biomass production without any external supplementation.

MATERIALS AND METHODS

The experiment for assessing the performance of *A. microphylla* was conducted in Randomized Block Design at Soil and Water Management Research Institute, Thanjavur during June 1995 to March 1996 in different soil series which are representing the Cauvery Delta Zone. Representative samples of Adhanur soil series was taken from H block of Tamil Nadu Rice Research

.nstitute, Aduthurai, for Kalathur from Kalathur, for Padugai from Valayapatti and for Alangudi from Alangudi. Care was taken during soil collection that it was well representing the series chosen and was drawn from the field where no crop was raised and the field was not added up with organic/ inorganic manures. Five kilos of soil in a cement pot had represented one soil series in a replication which was repeated three times. But for water, no nutrients were added and the pots were watered regularly. Ten grams of biomass of *A. microphylla* was added in each pot at the start of experiment and after a week, biomass produced in each pot was recorded. Fresh biomass of 10 g was added and the experiment was repeated for successive 37 weeks. Care was taken to avoid the sppillage of biomass either due to rains or insects.

RESULTS AND DISCUSSION

Two way interaction table of soil series and weekly interval towards *A. microphylla* biomass production is given in Table 1. In general, significant differences were noticed among the different soil series and also among the different weekly intervals. Kalathur soil series over 37 weeks had supported *Azolla* biomass production to a considerable level (56.16 g) followed by Alangudi soil series (53.27 g). Higher biomass production has been always corresponding with higher level of ammonia excretion which was well documented by Lakshmanan *et al.*, 1997. In general, free living nitrogen fixing organism do not excrete ammonia into the plant environment, but it is released by mineralisation only after the organsim perish (Ito and Watanabe, 1986). But as such, Azolla which buttress the free living cyanobacteria, approximately uses 40 percent of the Nitrogen fixed of which a part might be excreted by *Azolla* in its environment (Meeks *et al.*, 1988). Hence it would be advisable to grow *A. microphylla* with rice in Kalathur soil series for getting more nitrogen available to the rice plants.

Adhanur soil series had supported to a little extent of biomass production (32.41 g). Over the 37 weekly intervals, a downward trend was evinced. Highest biomass production irrespective of different soil series was noticed during seventh weekly interval (3.8.95 to 9.8.95, 82.08 g) followed by sixth weekly interval (27.7.95 to 2.8.95, 78.50 g) and third weekly interval (6.7.95 to 12.7.95, 78.08 g). Though there was a slight depression in biomass production between 11th and 18th weekly interval, it shot up from 19th weekly interval to 22nd weekly interval. Then onwards a slow declining trend was exhibited. Watanabe and Berja (1983) observed small amounts of ammonia excretion during active growth when temperature has gone up.

Within the soil series, Adhanur soil series during third weekly interval (6.7.95 to 12.7.95, 80.0 g) produced the highest biomass whereas it was seventh weekly interval (3.8.95 to 9.8.95, 106.67 g) for Kalathur soil series. Again for Padugai soil series also seventh weekly interval (98.33 g) was found to be the best week in buttressing maximum biomass production of *Azolla microphylla*. In the case of Alangudi soil series, sixth weekly interval (27.7.95 to 2.8.95, 111.67 g) was found to be the best period.

On the contrary, during 11th to 13th weekly intervals (31.8.95 to 20.9.95), biomass produced in the Adhanur soil series was the least (7.33 to 10.0 g) Later, the production increased and stabilized over the rest of the period. This lag period might probably due to late release of P from the soil which is a much needed nutrient. In Kalathur and Padugai soil series, production of biomass had become low and stabilized from 25th (7.12.95 to 13.12.95) and 23rd (23.11.95 to 29.11.95) weekly intervals respectively. Gradual declining of biomass production was evident from 23rd weekly interval (23.11.95 to 29.11.95) in all the soil series and over the consecutive weeks, declining trend got stabilized.

From the experiment, the following conclusions were arrived.

i) With the native nutrient availability, all the soil series taken for the study could support the biomass production to a considerable level only upto 23 weeks after which the produced biomass in successive weeks were almost on par. Thus economic production level of *A. microphylla* biomass without any external supplementation could not be extended beyond 23 weeks.

ii) In Kalathur, Padugai and Alangudi soil series, the highest *Azolla* biomass production was

Table 1. Interaction of soil series and weekly interval for *Azolla* biomass production (g, average over three replications)

Weekly Interval	Soil Series				Mean
	Adhanur	Kalathur	Padugai	Alangudi	
22.6.95 - 28.6.95	57.33 abc	80.67 bcd	63.33 b-f	79.33 bc	70.17
29.6.95 - 5.7.95	58.33 abc	60.67 d-g	67.67 bcd	72.67 bcd	64.83
6.7.95 - 12.7.95	80.00 a	94.00 abc	55.00 c-h	83.33 b	78.08
13.7.95 - 19.7.95	66.67 ab	42.33 f-j	60.00 c-g	71.67 bcd	60.17
20.7.95 - 26.7.95	61.67 ab	55.00 e-i	60.00 c-g	78.33 bc	63.75
27.7.95 - 2.8.95	15.67 fg	100.00 ab	86.67 ab	111.67 a	78.50
3.8.95 - 9.8.95	55.00 bc	106.67 a	98.33 a	68.33 b-e	82.08
10.8.95 - 16.8.95	50.00 b-e	101.67 ab	68.33 bcd	90.00 b	77.50
17.8.95 - 23.8.95	28.33 efg	71.67 cde	85.00 ab	71.67 bcd	64.17
24.8.95 - 30.8.95	20.67 fg	63.33 def	65.00 b-e	50.00 d-g	49.75
31.8.95 - 6.9.95	7.33 g	37.33 g-j	30.00 hij	28.00 gh	25.67
7.9.95 - 13.9.95	8.67 g	40.00 f-j	28.33 ij	33.33 gh	27.58
14.9.95 - 20.9.95	10.00 g	39.00 f-j	30.00 hij	43.33 fgh	30.58
21.9.95 - 27.9.95	22.33 fg	51.67 e-i	41.67 e-j	58.33 c-f	43.50
28.9.95 - 4.10.95	25.67 fg	53.33 e-i	41.67 e-j	51.67 d-g	43.08
5.10.95 - 11.10.95	23.33 fg	53.33 e-i	36.00 g-j	41.67 fgh	38.58
12.10.95 - 18.10.95	16.67 fg	30.33 ij	37.67 g-j	31.67 gh	29.00
19.10.95 - 25.10.95	23.33 fg	37.67 g-j	36.67 g-j	37.67 fgh	33.83
26.10.95 - 1.11.95	53.33 bcd	93.33 abc	73.33 bc	90.00 b	77.50
2.11.95 - 8.11.95	53.33 bcd	86.67 abc	48.33 d-i	80.00 bc	67.08
9.11.95 - 15.11.95	50.00 b-e	90.00 abc	48.33 d-i	86.67 b	68.75
16.11.95 - 22.11.95	50.00 b-e	60.00 d-h	50.00 c-i	83.33 b	60.83
23.11.95 - 29.11.95	24.67 fg	55.00 e-i	28.33 ij	36.67 fgh	36.17
30.11.95 - 6.12.95	26.67 efg	51.67 e-i	30.00 hij	28.33 gh	34.17
7.12.95 - 13.12.95	25.00 fg	41.67 f-j	28.33 ij	23.33 h	29.58
14.12.95 - 20.12.95	19.00 fg	43.33 f-j	26.67 ij	29.33 gh	29.58
21.12.95 - 27.12.95	25.00 fg	46.00 f-j	31.67 hij	33.33 gh	34.00
28.12.95 - 3.1.96	31.67 d-g	49.00 e-j	25.33 ij	38.33 fgh	36.08
4.1.96 - 10.1.96	22.33 fg	35.00 hij	26.67 ij	35.00 fgh	29.75
11.1.96 - 17.1.96	27.33 efg	48.33 e-j	40.00 f-j	36.67 fgh	38.08
18.1.96 - 24.1.96	25.00 fg	40.00 f-j	38.33 g-j	46.67 e-h	37.50
25.1.96 - 31.1.96	36.67 c-f	51.67 e-i	43.33 e-j	45.33 e-h	44.25
1.2.96 - 7.2.96	25.00 fg	47.00 f-j	35.00 g-j	41.67 fgh	37.17
8.2.96 - 14.2.96	21.67 fg	33.33 ij	39.33 f-j	42.67 fgh	34.25
15.2.96 - 21.2.96	18.33 fg	32.67 ij	37.33 g-j	35.00 fgh	30.83
22.2.96 - 28.2.96	11.67 fg	25.00 j	20.00 j	23.33 h	20.00
29.2.96 - 5.3.96	21.67 fg	30.00 ij	25.00 ij	32.67 gh	27.33
Mean	32.41	56.16	45.59	53.27	46.86

In a column, means followed by a common letter are not significantly different at 5% level of DMRT.

observed during sixth and seventh weekly interval while for Adhanur it was during third week.

iii) Among all the soil series, Kalathur has supported higher biomass production over a range of time owing to its higher available P status compared to other soil series.

iv) Soil available nutrient status shows that Kalathur is having a Water Holding Capacity of 55 per cent, Cation Exchange Capacity of 35 me/100g, N status - low, P and K status - medium whereas other soil series are exhibiting relatively a lesser water holding capacity and are low in N, P and K status. This fact suggests the role of P (and K to a little extent) in buttressing the biomass production of *Azolla*.

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EFFECT OF CROP MIXTURES ON THE INCIDENCE OF THRIPS *Thrips tabaci* LINDEMAN IN ONION*

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ABSTRACT

Thrips infestation was significantly less on onion plants in crop mixtures than on pure crop. Tomato, mint and coriander were significant in lowering thrips population densities on onion in crop mixtures. Tomato had greater influence than coriander and mint. However, in contrast to the pest load, the bulb yield of onion was significantly less in plots where onion was intercropped with tomato.

KEY WORDS : *Thrips tabaci*, Onion, Crop mixtures.

Thrips, *Thrips tabaci* Lind, is the most serious pest of onion which can cause yield loss upto 50 per cent (Rahman and Batra, 1945). Insecticides are often chosen to control the thrips as they are rather susceptible to chemicals (Mohan and Kumar, 1980 ; Reddy and Jagadish, 1980 ; Gawande *et al.*, 1984 ; Warriah *et al.*, 1994). However, pesticides leave behind residues and environmental problems. On the other hand, management of thrips by manipulating the cultural practices is a risk-free alternative. Mixing or intercropping of onion with other crops is worth evaluating in view

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