growth rate of plant organs such as root and shoot (Thinmann, 1974). It has been reported by number of workers that plant growht regulating substances of kind indole acetic acid (IAA), gibberellic acid (GA) and cytokinins produced by *Rhizobium* (Henson and Wheeler, 1976) *Azospirillum* (Tien *et al.*, 1980) and phospho bacteria (Barea *et al.*, 1976) Kalugasalam, (1981) reported that the inoculated phosphorus solubilising bacteria mediate the release of phosphorus from insoluble phosphates and fixation of atmospheric nitrogen by *Azospirillum* and *Rhizobium* in plants results in better growth, nodulation, total N and P content and yield of the crop.

The above study clearly indicated that there exists a synergistic effect between *Rhizobium*, *Azospirillum* and phosphobacteria inoculation which improves the plant growth, nodulation, plant nutrient status and yield of groundnut.

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EFFECT OF MICRONUTRIENT CHELATES ON THE YIELD AND DRYMATTER PRODUCTION OF GROUNDNUT AND PADDY

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ABSTRACT

Field experiments conducted to study the effect of micronutrient chelates on the yield and drymatter production of groundnut and paddy in Typic Haplustalfs and Typic Ustochrepts soils respectively revealed that the application of $ZnSO_4$ @ 25.0 kg/ha recorded the highest drymatter yield at initial stages for both the crops, while at later stages, foliar spray of CMM @ 0.5% twice at 30th and 40th DAS registered the highest pod yield in groundnut, whereas in paddy, foliar spray of 0.5% Zn chelate recorded the highest yield.

KEY WORDS : Micronutrient Chelates, Groundnut, Paddy, Yield, Drymatter, Foliar Spray

Intensive agricultural practices with prolonged use of micronutrient free high analysis fertilizers and mining of the plant nutrients through removal of produce without returning the residues to the soil resulted in wide spread micronutrient deficiency in soils. The escalating price of inorganic [illegible] besides their ra id solubilit and unavailability to plants due to soil reactions suggest to recommend chelates as an alternate source to enhance the availability of native and applied micronutrients to plants. Hence, experiments were conducted to evaluate the efficacy of micronutrient chelates on the yield and drymatter production (DMP) of groundnut and paddy.

MATERIALS AND METHODS

Field experiments were conducted during 1992-'93 to evaluate the efficacy of chelated micronutrients on the yield and DMP of groundnut var. CO 2 at the Tamil Nadu Agricultural University Farm, Coimbatore and paddy var. IR 20 at farmer's field Chithode, Periyar District. The sandy clay soil of the Cotton Breeding Station, Tamil Nadu Agricultural University, Coimbatore (Typic Haplustalfs) and the sandy clay loam soil of Chithode (Typic Ustrocrepts) were tested to be neutral in reaction (pH 7.0 and 6.9 respectively). The EC, CEC and 0.C of the soils were 0.10 and 0.46 dSm^{-1}; 18.7 and 17.1 c mol (p^+) kg^{-1} and 0.36 and 0.46 g kg^{-1} respectively. The available N, P and K for the above soils were 389, 16 and 698; 345, 14.5 and 682 kg ha^{-1}. The experimental soils were deficient in zinc (0.89 and 0.60 mg kg^{-1} respectively) and sufficient in other micronutrients. There were eight treatments, replicated thrice in a randomised block design. The healthy groundnut kernels were sown and 26 days old paddy seedlings were transplanted in the field after imposing the treatments. Recommended fertilizers (17:34:51 kg NPK/ha for groundnut and 100:50:50 kg NPK/ha for paddy) were applied besides taking up the proper plant protection measures. The chelated micronutrients and their mixture were supplied by M/s.Bhagyanagar Laboratories, Hyderabad. The nutrient content of the chelated micronutrients was as follows : ZnEDTA - 11.5% Zn; CuEDTA - 9.5% Cu, FeEDTA - 11% Fe: MnEDTA - 9.5% Mn: CaEDTA - 8.5 Ca: MgEDTA - 5.25% Mg. The crops were grown to maturity and harvested. The DMP at all growth stages of both the crops were recorded alongwith grain and straw yield.

RESULTS AND DISCUSSION

The results revealed that, the highest DMP was recorded by the application of $ZnSO_4$ @ 25 kg/ha in the initial stages, while at later stages, the foliar spray of chelated micronutrient mixture twice at 30th and 40th days after sowing, (DAS) registered the highest drymatter yield (9714 kg/ha) in groundnut (Table 1). The highest haulm (8311 kg/ha) and pod yield (1327 kg/ha) were also found to be associated with the same treatment. The combined effect of Zn, Fe, Cu, Mn, Ca and Mg present in the chelated micronutrient mixture might have enhanced the availability and uptake of all these nutrients which inturn increased the yield (Gupta and Gupta, 1985).

With regard to paddy, the maximum grain (4540 kg/ha), straw (8383 kg/ha) and drymatter yield (12,923 kg/ha) was obtained with the foliar spray of 0.5% Zn chelated to nursery coupled with the soil application of Zn chelate @ 1000 g/ha. This was closely followed by the foliar spray of 0.5% Zn chelate alone at tillering and after 15 days which recorded a grain yield of 4403 kg and straw yield of 8240 kg/ha. The minimum grain and straw yield and DMP were observed in control plots. The high solubility, and stability of Zn chelates besides its increased movement of ions to the plants might have increased the yield and drymatter production (Sriramachandrasekaran and Mathan, 1991). The

Table 1. Effect of micronutrient chelates on dry matter production, pod and haulm yield of groundnut var. Co 2 (Mean of three replications)

Treatments	Yield (kg/ha)		DMP (kg/ha)		
	Haulm	Pod	Vegetative	Flowering	Harvest
Control (NPK alone)	6931	891.0	877	5752	7822
Zn SO_4 @ 25 kg/ha	7145	946.0	1112	7802	8091
Fe SO_4 @ 50 kg/ha	7485	1075.0	1077	7055	8560
Zn SO_4 @ 25 kg + Fe SO_4 @ 50 kg/ha	7344	1142.0	1106	6956	8486
0.5% Zn chelate F.S.twice (30 & 40 DAS)	8279	1086.0	878	6633	9365
1.0% Fe chelate F.S.twice (30 & 40 DAS)	8095	1204.0	890	5896	9299
0.5% CMM F.S. twice (30 & 40 DAS)	8311	1327.0	892	6137	9638
1% CMM F.S. twice (30 & 40 DAS)	7852	1186.0	905	5920	9038
CD (0.05%)	816.0	179.0	NS	1685	1079

CMM - Chelated Micronutrient Mixture (ZnEDTA 30; FeEDTA 30; MnEDTA 10; CaEDTA 15; CuEDTA 5; MgEDTA; B as boric acid 5 gram each)

DMP - Drymatter production

Table 2. Effect of micronutrient chelates on dry matter production, grain and straw yield of paddy IR.20 (Mean of three replications)

Treatments	Yield (kg/ha)		DMP (kg/ha)		
	Grain	Straw	Active tillering	Panicle initiation	Harvest
Control (NPK alone)	3230	6028	2651	4276	9258
Zn SO_4 @ 25 kg/ha	3890	7262	3392	5035	11152
0.5% Zn chelate F.S at Tillering stage	4053	7514	2854	6346	11567
0.5% Zn chelate F.S at Tillering and after 15 days	4403	8240	2908	5937	12643
0.5% Zn chelate F.S on paddy nursery + 1000 g Zn chelate as soil application + 0.5% Zn chelate F.S at tillering	4170	7931	3605	6105	12101
0.5% Zn chelate F.S on paddy nursery + 1000 g Zn chelate as soil application	4540	8383	3817	6287	12923
100 g CMM on paddy nursery + 1000 g CMM on soil application + 0.5% CMM F.S at tillering	4360	8176	3543	6303	12536
100 g paddy nursery + 1.0% CMM F.S. at tillering	3980	7523	3006	5842	11503
CD (0.05%)	623	750	466	512	869

FS - Foliar spray;
CMM - Chelated Micronutrient Mixture (ZnEDTA 60; FeEDTA 15; MnEDTA 3; CuEDTA 3; MgEDTA 11; CaEDTA 15; and B as boric acid 2 gram each)

positive relationship existed between the concentration of Zn and other nutrients also lends support to the above phenomenon (Table 2).

In general, foliar application of 0.5% Zn chelate significantly increased the pod, and haulm yield of groundnut, whereas in paddy, the same treatment in addition with 1000 g zinc chelate/ha as soil application increased the grain and straw yield.

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EFFECT OF NEEM PRODUCTS ON INSECT PESTS OF RICE AND THE PREDATORY SPIDER

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ABSTRACT

Neem oil (NO) 3% and neem seed kernel extract (NSKE) 5% high volume applications were superior to monocrotophos, neem cake extract (NCE) 10% and neem coated urea (NCU) treatments in suppressing brown planthopper (BPH) *Nilaparvata lugens* (Stal) population 3 days after spraying (DAS) in *Kharif* season. NO 3% and NSKE 5% also effectively checked leaf folder, *Cnaphalocrocis medinalis* (Gunee), upto 14 DAS and were on par with monocrotophos 0.04%. Ear head bug *Leptocorisa* spp population remained very low in all the plots treated with neem products. There was a better recolonisation of the predatory wolf spider, *Lycosa pseudoannulata* in neem treatments. The yield level in these treatments was comparable to that of insecticide treatment. Yellow stem borer, *Scirpophaga incetulas* (Walker) incidence was not reduced by neem products in the *rabi* season.

KEY WORDS : Neem Products, Rice Pests, Spiders