ZINC DEFICIENCY IN COCOA GROWING AREAS OF ANDHRA PRADESH AND TAMILNADU

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Introduction

Andhra Pradesh and Tamil Nadu states are the new entrants in commercial cocoa cultivation have an area of about 16,969 ha and 9347 ha respectively under cocoa in 2009-2010. With the increase in area and age of plantations pest and diseases are becoming more important. Among the nutritional deficiencies in cocoa, zinc deficiency has been found to be of serious concern in some of the cocoa growing areas of India. A roving survey of cocoa gardens in Andhra Pradesh and Tamil Nadu revealed the importance of this problem. Zinc deficiency of cocoa plants was observed in all the gardens surveyed in Andhra Pradesh and severe incidence was observed in 22% of the gardens. Among the gardens surveyed in Tamil Nadu, it was observed in 73% of the gardens with severity in 10% of the gardens. The symptoms of zinc deficiency were recorded in detail. Chlorosis, vein banding, crinkling of leaves with wavy margin reduction in width of lamina giving a ribbon like appearance to the leaves, sickle leaf, rosette and dieback were found to be the characteristic symptoms of zinc deficiency in cocoa. This is the first report of occurrence of zinc deficiency of cocoa in Andhra Pradesh. The wide spread occurrence of zinc deficiency in cocoa plantations in Andhra Pradesh and Tamil Nadu warrants its proper diagnosis and correction so that the production and productivity of cocoa in the newly planted areas will not be affected.

Materials and Methods

A random survey had been undertaken during 2009 in major cocoa growing areas in Tamil Nadu and Andhra Pradesh. During the survey, gardens were selected depending on the area under cultivation. Thus a total of 40 gardens in Coimbatore and Kanyakumari districts of Tamil Nadu and 75 gardens in East and West Godavari districts of Andhra Pradesh were covered. Observations on the incidence of zinc deficiency symptoms were recorded based on symptomatology. For this, all the plants in each garden were observed. The incidence was recorded if five or more plants were showing typical symptoms of zinc deficiency. During the survey in the newly cultivated areas, the symptoms of zinc deficiency were recorded in detail. Incidence of zinc deficiency symptoms were further confirmed by applying zinc sulphate plus lime as foliar spray and observing the correction of deficiency symptoms in the affected gardens.

Results and Discussion

Among the two states, zinc deficiency of cocoa was found to be a major problem in Andhra Pradesh where symptoms were noticed in all the gardens surveyed. But it was observed as a major problem in 22% of the gardens surveyed. Among the gardens surveyed in Tamil Nadu this problem was observed in 73% of the gardens. Hence it was observed as a major problem in less than 10% of the gardens surveyed. Its sporadic occurrence was also observed in some of the nurseries in Tamil Nadu and Andhra Pradesh. Sporadic incidence of zinc deficiency of cocoa was earlier reported from cocoa plantations in Kerala and Karnataka states and rarely in Kanyakumari district of Tamil Nadu (ChandraMohanan and Kaveriappa, 1981). Zinc deficiency in cocoa has been reported in Ghana (Ahenkorah, 1969; Greenwood and Hayfron, 1951), New Guinea (Schroo, 1959) and west Malyasia (Ng, 1971). This is the first report of its wide spread occurrence in Andhra Pradesh. Deficiency of zinc was observed in cocoa grown as a mixed crop mainly in coconut gardens. In some of the cocoa gardens in Andhra Pradesh, more than 75% of the plants were found to be showing the symptoms of zinc deficiency. Of these, some plants exhibited acute deficiency symptoms including dieback. There was no yield in such plants.

Considering the importance of increasing incidence and intensity of zinc deficiency of cocoa, the symptoms as observed in the nature were recorded in detail. The initial symptom of the disease was often observed as chlorosis, which appeared in patches. As the deficiency advanced the green colour of the lamina was found only along the sides of the vein giving a vein banding appearance to the leaves.

Thus, there was a distinct network of greenish colour of lamina along the veins and veinlets. At this stage the farmers misunderstood it as a virus disease. Affected leaves showed symptoms such as mottling and crinkling with wavy margin, giving a malformed or abnormal appearance to the leaves. With the progress of the symptoms the younger leaves and newly formed leaves were much reduced in size, narrow, almost ribbon like and sickle shaped. The affected twigs showed characteristics little leaf symptoms. The sickle leaf symptom was very common. New leaves appeared at the tip of the twigs only at the initial stage of the symptoms. Later the production of the flushes ceased. When new flushes appeared in the initial stage of deficiency the tender leaves showed acute symptoms of zinc deficiency such as chlorotic spots, much reduction in size, mottling, crinkling and sickle shape.

With the advancement of the symptom expression, the nodes in the twigs appeared very close. The shortening of internodes gave a rosette type of growth. When such symptoms appeared on most of the twigs the plant showed a retarded growth with unhealthy appearance. Ultimately premature defoliation leading to dieback of branches was observed. The twig symptoms included rosette and dieback. Various combinations of these symptoms were also observed in almost all the gardens in Andhra Pradesh and Tamil Nadu. In many of the gardens severe defoliation and dieback caused sporadic gradual death of young cocoa plants of about 2-4 years old.

Based on the characteristic symptoms the malady observed in the cocoa plantations of Andhra Pradesh has been diagnosed as zinc deficiency with acute deficiency symptoms in some of the plants. It was further confirmed by foliar application of a mixture of 3 g zinc sulphate and 1.5 g lime in one litre of water (ChandraMohanan *et al.,* 1981). The deficiency could be corrected by this treatment. The treated plants resumed normal growth one month after the foliar spray and produced many new leaves which were free from deficiency symptoms. But there was no much improvement in the leaves showing acute deficiency symptom before the treatment.

The detailed field observations revealed that chlorosis, crinkling of leaves with wavy margin, little leaf; sickle leaf, rosette, premature defoliation and dieback were the characteristic symptoms of zinc deficiency in cocoa. Foliar spray of a mixture of zinc sulphate and lime were found to be a very effective method in correcting zinc deficiency in cocoa.

There are different factors leading to zinc deficiency in cocoa. Jurine and Thorne (1955) have reported that zinc solubility is minimum within the pH range of 6.0-8.0 in soil. Schroo (1959) in his studies on zinc deficiency in cocoa trees of New Guinea had indicated high pH and poor aeration of the soil as the main causes. However, detailed studies are necessary to find out the factors affecting wide spread incidence of zinc deficiency in cocoa plantations in Andhra Pradesh.

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