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Effect on system productivity through inter crop diversification in agri-horti system in arid ecosystem of western Rajasthan

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Abstract

An experiment was conducted on the "study of system productivity through intercrop diversification in agri-horti system in arid ecosystem of western Rajasthan" at research farm of ICAR-CAZRI, Regional Research Station, Bikaner on the existing plantation of 10 year old plantation of citrus (*Citrus aurentifolia*), bael (*Aegle marmelose*) and *gonda* (*Cordia myxa*) planted with drip irrigation system under agri-horti system. The experiment was conducted under factorial Randomized Block design with three replications. The experimental results revealed that the intercropping of legumes (rainfed) has no competition in agri-horti system, showing positive effect on growth and yield of fruit trees. Growth parameters of all the trees were found to be non-significant in intercropping of *Lasiurus sindicus* and aloe-vera over no intercropping. Intercropping of mothbean with bael gave highest plant height of bael which was 15.9, 13.05, 4.90 and 10.70 per cent higher over intercropping of clusterbean, aloe-vera, *L. scindicus* and sole, respectively. Yield of intercrops were highest with citrus and lowest with bael during both the years. Highest water use efficiency (0.98 kg/mm) was in intercropping of mothbean with citrus whereas in perennial crops, *L. sindicus* showed highest WUE of 19.4 kg/mm in intercropping with citrus. The CEY was highest in all the crops in intercropping with citrus over rest of the trees under agri-horti system.

Key words: Agri-horti system, arid ecosystem, clusterbean equivalent yield , water use efficiency

Introduction

Intercropping is a technique of crop intensification in both space and time where in the competition between crops may occur during a part or whole of crop growth period. Beets (1982) thought that crop insurance was a major principle of intercropping in that if environmental factors change, some of the intercrop does well when others do poorly. In some related studies, the results indicated that competition for nutrients does not exist in intercropping systems (Jose *et al*., 2000; Thevathasan *et al*., 2004). Therefore, it is very important to explore the competitive mechanism in intercropping systems, in order to provide optimum management strategies and technologies for managing intercropping system with high-yield, high-efficiency and stabilization. Within tree-based intercropping systems, a number of factors can influence tree shading of adjoining agricultural crops. Intercropping of different field crops in cassava indicated that all intercropping systems had LER greater than 1 which varied between 1.35 (cassava + upland rice) and 1.6 (cassava + peanut) which showed the profitability of intercropping (Islami *et al*., 2011). Mahant (2011) inferred that intercropping in banana was more productive and profitable than their sole cultivation without loss in yield.

India is facing a big challenge in balancing its dual objectives of food security and crop diversification to increase farm income. The India's low crop productivity, limited irrigation facilities and underdeveloped infrastructural support like cold storages, markets, roads, and transportation, which have increased the woes of Indian horticulturists. As India begins to market its agricultural produce across political boundaries, it can add new dimensions to its commercial viability in agriculture. Within the horticulture sector also, besides spices, fruits and vegetables are the major crops where the area under cultivation has increased. This gain in area under horticulture and mainly under fruits and vegetables is a collective impact of diversification of the production pattern of producers and increased demand of the consumers due to shift in their consumption pattern (Mittal, 2009).

Tree-based intercropping one of the excellent farming system and can contribute much to our understanding of sustainable agriculture practices. Our current research goals are to address and quantify the numerous biophysical interactions that occur at the tree-crop interface in order to enhance our understanding of the ecology of tree-based intercropping. Investigations over the last decade have documented several complementary biophysical interactions. Nitrogen (N) transfer from fall-shed leaves to adjacent crops with enhanced soil nitrification as the proposed mechanism was estimated to be 5 kg N ha . Soil organic carbon (C) adjacent to tree rows has increased by over 1%, largely as a