



# Yield and Nutrition of Moth Bean-Mustard Rotation in Soils Amended with Tree Leaf Litters in the Arid Region of Rajasthan

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## ABSTRACT

**Background:** The incorporation of leaf litters in agroforestry systems can meet a significant share of nutrients demand and improve crop yield. The *Citrus aurantifolia*, *Aegle marmelos* and *Cordia myxa* (among fruit trees) and *Colophospermum mopane*, *Acacia senegal*, *Acacia tortilis*, *Dalbergia sissoo* (among trees) are well-adapted species to the arid environment. Unfortunately, little work has been done in the past to study the influence of leaf litters of these species on yield and nutrition of crops grown in arid region. Therefore, the present experiment was planned to study the influence of leaf litters of *Colophospermum mopane*, *Acacia senegal*, *Acacia tortilis*, *Dalbergia sissoo*, *Citrus aurantifolia*, *Aegle marmelos* and *Cordia myxa* on yield and uptake of nutrients in moth bean and Indian mustard in arid region.

**Methods:** Field experiment was conducted at ICAR-Central Arid Zone Research Institute, Regional Research Station, Bikaner in moth bean-mustard rotation during 2010-11 and 2011-12 by incorporating leaf litters of seven tree species i.e. Mopane (*Colophospermum mopane*), Gum acacia (*Acacia Senegal*), Umbrella tree (*Acacia tortilis*), Indian rosewood (*Dalbergia sissoo*), Sour lime (*Citrus aurantifolia*), Assyrian plum (*Cordia myxa*) and Bengal quince (*Aegle marmelos*) in randomized block design with three replications. Grain and straw yield was recorded and analysed for N, P and K content.

**Result:** The maximum grain yield of moth bean and its residual effect on mustard was observed in the soils amended with leaf litters of *Citrus aurantifolia* followed by *Aegle marmelos* and *Dalbergia sissoo*. The total uptake of N, P and K was significantly higher in the treatments of *Citrus aurantifolia* and *Aegle marmelos*, which was due to the higher dry matter production of crops, faster rate of litter decomposition and higher release of nutrients.

**Key words:** Leaf litters, Moth bean, Mustard, Nitrogen, Phosphorus, Potassium, Yield.

## INTRODUCTION

Soils in the arid regions are often poor in fertility as they are coarse in texture, low in organic carbon (0.05-0.20%), low in nitrogen (0.028-0.05%), low-to-medium levels of available phosphorous (10-25 kg ha<sup>-1</sup>), low vegetation cover and high temperatures (Kumar *et al.*, 2009). They are prone to wind erosion (Kar *et al.*, 2009) which affects agricultural production directly through crop damage and indirectly through loss in soil fertility (Soni *et al.*, 2013; Santra *et al.*, 2017). Over the last two decades, a great emphasis is being laid on the development of arid lands through various agroforestry systems viz. agri-horti, agri-silvi, agri-pasture models (Sharma, 2009; Soni *et al.*, 2013; Yadava *et al.*, 2017). The perennial components of these agri-horti or agri-silvi systems play a great role in nutrient cycling and energy transfer in soil-plant systems (Singh, 1971). Through the process of litter decomposition and mineralization, the unavailable form of nutrients viz. N and P contained in leaf litters get converted into more available form and a significant amount of nutrients are released which increase the yield of associated intercrops in agroforestry systems (Bhatt *et al.*, 1997; Singh *et al.*, 1998; Groffman *et al.*, 1996; Rasal and Patil, 1993).

The *Citrus aurantifolia*, *Aegle marmelos* and *Cordia myxa* (Among fruit trees) and *Colophospermum mopane*, *Acacia senegal*, *Acacia tortilis*, *Dalbergia sissoo* (Among trees) are well-adapted species to the arid environment

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under limited water conditions. Litterfall from these species are variable (CAZRI, 2016) and may play a vital role to improve soil organic matter and nutrients release. The studies have shown that the nutrient release behaviour differs from species to species depending upon the chemistry of leaf litters (Soni *et al.*, 2016 and Meena *et al.*, 2018), soil properties, weather conditions and population of soil microorganisms (Mugendi and Nair, 1997; Singh and Sharma, 2007). Unfortunately, little work has been done in the past to study the influence of leaf litters of these species on yield and nutrition of crops grown in the arid region. Moth bean (*Vigna aconitifolia* Jacq.) is an important arid legume