Use of Parthenium Weed as Green Manure for Maize and Mungbean Production

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A pot experiment was conducted to evaluate the potential of parthenium weed (Parthenium hysterophorus L.), a noxious invasive alien weed, for use as green manure. Maize (Zea mays L.) and mungbean [Vigna radiata (L.) Wilczek] were used as test crops. The treatments employed were: control, recommended NPK fertilizers and 1%, 2%, 3% and 4% (w/w) parthenium green manure (fresh weight basis). Parthenium was collected at 30–35 d growth stage prior to flowering. After the parthenium manure was mixed in the soil, the pots were irrigated and left for 30 d to allow decomposition. Maize and mungbean were harvested 60 and 70 d after sowing, respectively. The highest root and shoot biomass in maize was obtained in 3% green manure treatment, which was significantly greater than that obtained in the control and equivalent to that obtained in the NPK fertilizer treatments. Effect of both NPK fertilizers and parthenium green manure on growth and yield of mungean was insignificant.

Key Words: Parthenium hysterophorus, green manure, Vigna radiata, Zea mays

INTRODUCTION

Frequent use of agrochemicals has polluted the environment to a great extent. Concern is growing that food produced under such a farming system may neither be safe nor have good quality. This has shifted the scientific approach toward some alternative measures (Shaxson 2006). Organic farming offers an alternative that can eliminate many of the environmental problems of modern agriculture. In comparison with conventional farming, organic farming has the potential benefits of improving food quality and safety (Giles 2004), improving soil structure (Pullman et al. 2003), alleviating environmental stresses (Macilwain 2004) and enhancing soil biodiversity (Oehl et al. 2004). Forage legumes are widely used as green manure crops to improve soil fertility and to increase the yield of subsequent crops in rotations as they are an effective source of N and also enhance the cycling of phosphorus and other nutrients for subsequent crops (Jensen et al. 2004; Turgut et al. 2005). However, there is a need to investigate the potential of other plant species, especially weeds, that produce huge amounts of plant materials for use as green manure.

Parthenium hysterophorus L. (Family Asteraceae, hereafter referred to as parthenium) is a rapidly growing invasive weed from North and South America that has invaded Asia, Africa and Australia during the last 50 yr (Navie et al. 1996). Since then, the weed has not only naturalized itself in many countries but has spread at an alarming rate. Parthenium poses serious health risks such as allergic contact dermatitis, rhinitis and asthma, particularly to urban populations (Kohli and Rani 1994). Chemical analysis indicated that it contains parthenin, coronopilin, tetranerin A, 2β-hydroxy coronopilin and hysteron A–D (Sethi et al. 1987; Ramesh et al. 2003; Belz et al. 2007). In addition to health hazards, a lot of available data also highlight its impact on agriculture as well as natural ecosystems (Batish et al. 2002; Singh et al. 2002). There are reports of total habitat change in native Australian grasslands, open woodlands, river banks and floodplains due to parthenium invasion (McFadyen 1992; Chippendale and Panetta 1994). Similar invasions of national wildlife parks have also been reported in southern India (Evans 1997). This weed is also spreading rapidly in wastelands and grazing lands in rainfed areas of the province of Punjab, North Western Frontier Province and Kashmir, Pakistan, and replacing the local flora (Javaid and Anjum 2005; Javaid et al. 2006). In spite of its many harmful effects, this noxious weed has many properties that make it useful as a green manure to enhance soil fertility and crop growth (Javaid 2004; Singh et al. 2007).