

Review Article

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Effect of Integrated Nutrient Management on Growth and Yield of Kalmegh (*Andrographis paniculata* Wall. Ex. Nees.): A Review

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ABSTRACT

Andrographis paniculata is also known as “Rice bitters” in West Indies and “King of bitters” or “Chiretta” in England. The fresh and dried leaves of Kalmegh and the juice extracted from the herb are official drugs in Indian pharmacopoeia. The whole herb is the source of several diterpinoids of which the bitter water-soluble lactone is important and is distributed all over the plant body in different proportions. Kalmegh (King of bitters), is used both in Ayurvedic and Unani System of medicines for immunological, antibacterial, anti-inflammatory, antithrombotic and hepatoprotective properties, using of different organic manure (FYM, Vermicompost, Green Manure, Poultry And Sheep Manure, Night Soil etc.) inorganic manure (Macro and Micro nutrients) and Bio fertilizers (rhizobium, VAM, *Azotobacter*, *Azospirillum*, P Solubilizing Bacteria) have assumed great importance for sustainable production and for maintaining soil health. In spite of supplying macro and micro-nutrients to the crop it also enhance physical, chemical and biological properties of the soil, which leads to good crop production. The advantage of combining inorganic and organic sources of nutrients generally results in better use of each component which is responsible for crop growth and development. In this paper, the literatures pertaining to the different aspects of integrated nutrient management are reviewed.

Keywords

Kalmegh, Organic manures, Inorganic manure, Bio fertilizers, Yield

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Introduction

Kalmegh (*Andrographis paniculata* Wall. Ex. Nees.) belongs to family Acanthaceae is one of the nineteen species of the genus *Andrographis* which is indigenous to India and has been used in Indian systems of medicine since time immemorial. Kalmegh is a bitter annual (perennial, if maintained) herb, erect, 50 cm to 1m in height, stem quadrangular, much branched; leaves opposite, short petioled; flowers in racemes. Fruit capsule, linear, oblong or elliptic; seeds

about 12 in number, subquadrate, brownish or creamy yellow. Kalmegh (King of bitters), is used both in Ayurvedic and Unani System of medicines for immunological, antibacterial, anti-inflammatory, antithrombotic and hepatoprotective properties. *Andrographolide* is an interesting pharmacophore with anticancer and immunomodulatory, antipyretic, antihepatotoxic, antihistamic, analgesic, antibacterial, antifertility and immunosuppressive, dysentery, diarrhea, enteritis, fever, cough, sore throat, tonsillitis, bronchitis, arthralgia, menstrual and

postpartum haematometra; hypertension and snake bite activities and hence has the potential to be developed as an anticancer chemotherapeutic agent as well. Kalmegh forms the principle ingredient of household medicine called "Alui", extensively used in West Bengal. Common ayurvedic drugs are "Kalmeghasava" and "Kalmeghnamayas Haub" (Sanjutha *et al.*, 2008). There is a growing concern about adverse effect of use of chemical fertilizers and chemical pesticides. Understanding the ill effects of such chemicals, it was deliberated to use organic manures (farmyard manure, oil cakes and vermicompost) and biofertilizers. The interactive advantage of combining inorganic and organic sources of nutrients generally results in better use of each component (Manna *et al.*, 2005).

Effect of integrated nutrient management on growth parameters and yield parameter of kalmegh

Makwana *et al.*, (2009) tested different organic manures and spacing on yield of Kalmegh-Panchang under middle Gujarat conditions. They observed that the growth attributes such as plant height (71.36 cm) and plant breadth (23.89) at harvest were significantly higher under treatment 30 cm × 45 cm. They recorded the highest fresh (10335 kg/ha) and dry yield (4375 kg/ha) of kalmegh under treatment of 30 cm × 45 cm.

Ramesh *et al.*, (2011) studied the effect of interactive influence of organic and inorganic fertilizers on the growth and yield of kalmegh.

They found that combined application of organic and inorganic fertilizers produce better growth and yield parameters. Application of VAM and its combination with added inorganic nutrients enhanced andrographolide content in kalmegh

Ram *et al.*, (2008) worked on spacing and organics on growth and herbage yield of kalmegh. They observed that the maximum plant growth viz., plant spread, number of primary and secondary branches and number of leaves/plant was found at wider spacing (30 × 40 cm) and concluded that the maximum fresh and dry herbage yield (94.18 q/ha and 54.33 q/ha) was obtained at closer spacing (30 × 30 cm). Interaction effect due to spacing and various sources of organics was found non-significant.

Sanjutha *et al.*, (2008) studied integrated nutrient management in kalmegh. They conducted experiment in Randomized Block Design (RBD) with 12 treatments replicated thrice at TNAU Coimbatore, India. They found that application of FYM @ 15 t/ha + NPK @ 75:75:50 kg/ha + Panchyagavya @ 3 % foliar spray recorded highest parameters, nutrient uptake, yield and andrographolide content.

Ram *et al.*, (2008) conducted an experiment on effect of spacing and organics on growth and herbage yield of kalmegh (*Andrographis paniculata* Wall. Ex. Nees.). The results indicated that the maximum plant growth viz., plant spread, number of primary and secondary branches and number of leaves per plant have been found at wider spacing (30 x 40 cm) and due to use of the application of FYM prolong to 50 per cent flowering (only 2 days) compared to control. The maximum fresh and dry herbage yield (94.18 q/ha and 54.33 q/ha) was obtained at closer spacing (30 x 30 cm).

Hemalatha and Suresh (2012) studied impact of integrated nutrients on growth and yield of kalmegh. They observed the highest plant height (56.54 cm/plant), number of branches (22.65/plant) and number of leaves (41.40/plant), leaf area (128.34 cm²/plant), dry biomass (2.639 t/ha) and fresh herbage

(1392.22 kg/ha) and alkaloid yield (0.739 %) in the treatment containing 15 t FYM/ha + 45:25:25 kg NPK/ha +1 kg *Azospirillum*/ha.

Patidar *et al.*, (2011) conducted research on biochemical constituents in kalmegh under various row spacings and nitrogen levels, at department of plant physiology, College of Agriculture 24 Jawaharlal Nehru krishi Vishwa Vidyalaya, Jabalpur M.P. India. They took three row spacings viz., 15, 30 and 45 cm and five nitrogen levels viz., 0, 40, 60, 80 and 100 kg/ha and found that 30 cm row spacing with 80 kg N level and their combination possessed the highest content of biochemical constituents.

Singh *et al.*, (2011) conducted an experiment on growth behaviour, biomass and diterpenoid lactone production in kalmegh strains at different population densities and found that growing of kalmegh strain CIM-AP-3 and planting at a closer spacing of 30 × 15 cm accommodating 2,22,222 plants/ha is suggested for obtaining maximum dry biomass and diterpenoid lactones yield under the subtropical climate of North India.

Dakhane and Nandkar (2012) studied the influence of nutrients on growth and medicinal content of *Andrographis paniculata* wall. Ex. Nees. And found that the highest herbage yield was obtained in treatment 200:140:15:90:60:25:44:20:14 kg /ha N, P, K, Ca, Mg, Fe, Mn, Zn, Cu, respectively.

The higher yield obtained in Kalmegh due to integration of inorganic fertilizers, bio fertilizers and organic manures could be due to the higher yield attributing characters like root length and girth, higher dry matter production by higher supply of nutrients, favorable physical and biological environment with increased organic carbon in the soil leading to better root activity and nutrient uptake. As Kalmegh is a root crop,

improvement of soil physical environment might be helped in better development of root development.

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