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Effect of integrated weed management practices on weed biomass and weed control efficiency in summer groundnut (*Arachis hypogaea* L.)

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Abstract
The present experiment entitled "Effect of Integrated weed management practices on weed biomass and weed control efficiency in summer groundnut (*Arachis hypogaea* L.)." was undertaken during *summer* season of 2017 at Career point University, kota. The salient findings of the present experiment have been summarized; Groundnut crop is highly susceptible to weed infestation because of its slow growth in the initial stages up to 40 days, short plant height and underground pod bearing habit. Groundnut- weeds comprise diverse plant species from grasses to broad-leaf weeds and sedges, and cause substantial yield losses (15-75%). Weeds affect groundnut through the production of harmful allelochemicals. Thus, weed control is the foremost critical production factor in groundnut cultivation. Herbicides were found to be selective in controlling many weeds in monocropping as well as in cropping systems. Herbicides, though, selective, efficient and cost effective weed control measure in controlling weeds in groundnut, the maximum benefit can be achieved by combining herbicides with manual, cultural and mechanical weed control methods. These methods of weed control also vary with the groundnut growing situation and the cropping systems. In this review, an effort was made to compile the information on feasible weed management practices for groundnut in India and the future strategies to very simple, cheap, effective, and environmentally safe integrated approaches.

Keywords: Weed management, groundnut

Introduction
Groundnut (*Arachis hypogaea* L.) is an important oilseed crop of India, occupying about 7.0 million hectare area, scattered over 260 districts of 12 states. It's also known as the "Wonder nut" or "Poor man's Cashew nut". In India, it is cultivated on an area of 5.53 M ha^{-1} with production of 7.5 M tones and productivity of 1750 kg ha^{-1} during 2015-2016 (AICRPG, 2016) [3]. Currently, six states *viz*. Gujarat, Andhra Pradesh, Karnataka, Tamil Nadu, Maharashtra and Rajasthan account for more than 90% of the total groundnut area and 89.3% of total groundnut production. Among the major groundnut growing states, Gujarat rank first in area (1.84 M ha^{-1}) and production (4.92 M tonnes) with productivity of 2670 kg ha^{-1} (AICRPG, 2016) [3]. In Gujarat, it is grown on an area of 0.94 M ha^{-1} with the production of 1.70 M tonnes and productivity of 1809 kg ha^{-1} during summer season (AICRPG, 2016) [3]. Weeds reduce yields by competing with the groundnut plant for resources, such as sunlight, space, moisture and nutrients not only throughout the growing season, but also create problem during digging and inverting procedures and reduce harvesting efficiency (Upadhyay, 1984) [14]. Harvesting losses increases as the biomass of weeds slow down the field-drying of groundnut vines and pods and increases the possibility of exposure to rainfall.
Weeds have allellopathic effect with groundnut (Bansal**,** 1993) [4] and they act as host for causal organisms of various diseases and insect pests. Integrated weed management in groundnut has great importance as groundnut suffers heavily due to weed competition in the early stage because of its short structure and initial slow growth, Up to 70% reduction in groundnut yield (Devekumar and Giri 1998) [7]. The loss in yield of groundnut pods due to weed competition ranged from 30 to 40% (Chandra Singh and Gupta 1973) [6]. Integrated weed management approach involving the use of two or more weed control techniques selected from five general categories *viz*., preventive, cultural, mechanical, biological and chemical in a well planned sequence, so designed that, it would not affect the ecosystem.

Materials and Methods
A field experiment was conduct during summer season 2017 at College Farm, Department of Agronomy, Career Point University. The experiment comprising 10 treatments was laid out in Randomized Block Design with 3 replications. The eastern side of the range, rainfall varies

from 500 mm in Ajmer to 1,000 mm in Jhalawar district. The south-western monsoon begins in late June in eastern Rajasthan and lasts until the middle of September. In most places rainfall is normally highest during July and August. Summer temperatures are 40-45 ^{0}C and winter temperatures 10-20 ^{0}C, but extremes of 48 ^{0}C and 12 ^{0}C are reached. A sharp decrease in night temperature is experienced throughout the arid and semiarid regions of western Rajasthan. The mean maximum and minimum temperature during the crop growth and development period ranged between 29.4 to 42.3 ^{0}C and 11.7 to 26.8 ^{0}C. The summer season remained hot particularly during third week of April to second week of May with maximum temperature below 42.3 ^{0}C and minimum temperature above 21.9 ^{0}C. The range of average relative humidity, bright sun shine, wind speed and daily evaporation was 35-87%, 1.3-10.8 h, 2.8-10.6 km hr^{-1} and 2.9-11.9 mm, respectively. For weed control different weedicides like Pendimethalin, Oxyfluorfen, Quizalofop-*p*-ethyl, Imazethapyr, Imazamox, Sodium Acifluorfen, Clodinofop proprigyl and biological control method used.

Results and Discussion

A number of herbicides were found to be selective in controlling weeds in groundnut. However, efficient and cost-effective weed control can be achieved by using either combination of herbicides or combining herbicide with other control methods. Combination of cultural, mechanical and chemical methods of weed management give higher weed control efficiency and economic benefits than that of any individual method. Pre-emergence application of fluchloralin @ 1.5 kg a.i. /ha along with wheat straw mulch or polythene mulch effectively control weeds in summer groundnut (Devi Dayal, 1990) [8]. Field studies at various locations throughout the country under AICRPG (AICRPG, 1997) Pendimethalin followed by two interculturing at 30 and 45 DAS. Whereas, application of pendimethalin followed by one hand weeding at 30 DAS and two interculturing at 30 and 45 DAS was most effective. Crop rotation is an effective way to control dicot weeds in groundnut. Groundnut grown in rotation with cereal crops and managing weeds in groundnut by applying pre-emergence herbicide with one or two intercultural operations was most sustainable and effective, higher planting density (20 x 15 cm) combined with pre emergence application of alachlor at 1.5 kg a.i./ha recorded the best weed control (Patro *et al*., 1981) [12]. Confirmed that weed control efficiency and net return increased significantly when chemical control measures are combined with mechanical and hand weeding measures (Belorkar *et al*., 1995; Murthy *et al*., 1994; Panwar *et al*., 1988) [5, 9, 10]. Better control of weeds at the early stages by fluchloralin 1.0 kg/ha and removal of weed subsequently by hand weeding at 40 DAS resultedin lesser weed dry weight (Ramakrishna and Ong, 1988) [13] and recorded higher pod and kernel yield (Patel *et al*., 1997) [11]. To keep the crop weed-free at pegging and pod development stages need a suitable post- emergence herbicide which can control of all type of weeds; grassy, narrow leaf weeds, sedges and broad leaf weeds, along with other methods of weed control. The recent AICRPG experiments (AICRPG, 2009) However, Pre-emergence application of pendimethalin @ 1.0 kg a.i./ha + one hand weeding at 45 DAS recorded the lowest weed density of both monocots and dicots.

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