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# Effects of weed management and sulphur nutrition on greengram [*Vigna radiata* (L.) wilczek) during summer season

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**Abstract**
A field experiment was conducted during summer season of 2016 at Instructional Farm of Rajasthan College of Agriculture, Udaipur to evaluate the effect of weed management and sulphur nutrition on weed biomass and yield of summer grengram [*Vigna radiata* (L.) wilczek] and profitability in terms of net returns and BC ratio. PE application of ready–mix of pendimethalin + imazethapyr 0.75 kg ha$^{-1}$ recorded the minimum weed biomass at each stage of observation thus, resulted in the highest grain yield (kg ha$^{-1}$) and eventually net returns (ha$^{-1}$) and BC ratio (1.67).

**Keywords:** Greengram, pendimethalin, imazethapyr, weed biomass, pre-emergence, post-emergence and yield

## Introduction
Greengram, a high protein (23-24 per cent) legume, occupies 14 per cent of total pulses area and 7 per cent of total pulse production in India (Singh *et al*., 2014) [5]. With the introduction of improved short duration, high yielding diseases resistant greengram [*Vigna radiata* (L.) wilczek], the significant increase in area and production has been observed in summer greengram during last one decade. Pendimethalin, a PE herbicides is used to control initial flush of weeds in most of pulses. However, sole application of pendimethalin is not sufficient to control the diverse group of weed flora. Hence, there was an urgent need to sort out a broad spectrum efficient herbicide to optimize productivity (Kumar *et al*., 2014) [4]. The yield reduction in greengram due to weeds is observed between the range of 30 to 50 per cent (Khairnar *et al*., 2014) [3]. Besides weed management, sulphur fertilization is too an important action taken to improved grain yield and productivity. Moreover, sulphur application through gypsum signifantly increased the growth and yield of greengram. Keeping this, the present experiment was planned to study the sulphur on growth and yield of summer greengram.

## Material and methods
A field experiment was carried out at Rajasthan College of Agriculture, MPUAT, Udaipur. The soil was medium in nitrogen (285 kg ha$^{-1}$), phosphorus (20.42 kg ha$^{-1}$) and low in sulphur content (9.8 ppm). The experiment comprised of five weed management practices (PE application of ready-mix of pendimethalin + imazethapyr 0.75 kg ha$^{-1}$, imazethapyr 100 g ha$^{-1}$ as post emergence 25 DAS, ready-mix of imazethapyr + imazamox 0.05 kg ha$^{-1}$ as post emergence 25 DAS, hoeing and weeding 25 DAS and weedy check) and three sulphur treatments (0, 20 and 40 kg ha$^{-1}$) thereby making fifteen treatment combinations. All herbicides were applied with knapsack sprayer fitted with flat fan nozzle and as per treatment sulphur was drilled in furrows through mineral gypsum containing 13 per cent sulphur at the time of sowing along with the basal dose of fertilizer. The experiment was laid out in Factorial Randomized Block Design replicated thrice. Greengram variety ‘SML-668’ was used as test crop with the seed rate of 20 kg ha$^{-1}$ following the packages as per the zone.

## Results and Discussion
The experimental field was heavily infested with mixed flora of broad leaved and grassy weeds, *viz*. *Echinochloa colona*, *Cynodon dactylon*, *Brachiaria ramosa*, *Dactyloctenium aegyptium among narrow leaved weeds and Commelina benghalensis*, *Amaranthus viridis*, *Trianthema portulacastrum* and *Digera arvensis among broad leaved weeds*.

### Effect on weed bio-mass
Table 1 elucidates that all the weed control treatments significantly affected weed dry biomass

at each stage of observation. The minimum weed dry biomass was observed under PE application of ready-mix of pendimethalin+ imazethapyr 0.75 kg $ha^{-1}$ at 20, 40, 60 DAS and at harvest with respective values of 6.41, 121.77, 476.72 and 643.49 kg $ha^{-1}$. The superiority of this treatment in controlling weeds over the rest of treatments was because of the fact that this treatment checked early growth of weeds right from their germination and late emerging weeds were effectively controlled either by residual effect or by smothering effect of greengram on weeds. Superiority of this combination of herbicides may also be due to double mode of action resulted into broad spectrum control of weeds. Pendimethalin is a versatile pre-emergence herbicide, rapidly absorbed by germinating weeds and inhibit both cell division and cell elongation in the root and shoot meristems of the susceptible plants. The growth is inhibited directly following absorbing through hypocotyls and shoot region. The plants die shortly after germination or emergence from the soil. While imazethapyr belong to group of imidazolinones is a selective herbicide which inhibits the plastid enzyme acetolactate syntheses (ALS) in plants and catalyses the first step in the biosynthesis of essential branched chain amino acids (Valine, leucine, isoleucine). The ALS inhibitors thus stop cell division and reduce carbohydrate translocation in the susceptible plants (Gupta, 2008) [2]. With respect to sulphur application, varying levels of sulphur failed to affect weed biomass due to the the fact that gypsum was applied in furrows and perhaps could not sufficiently available to the majority of weeds in the interspaces of crop rows where the infestation of weeds was more. Moreover, the applied gypsum in furrows boosted the crop growth vigorously which later on smothered the weeds beneath it.

**Table 1:** Effect of weed management and sulphur nutrition on total weed biomass (kg $ha^{-1}$) in summer greengram

| Treatments | 20 DAS | 40 DAS | 60 DAS | At harvest |
|---|---|---|---|---|
| WEED MANAGEMENT | | | | |
| Pendimethalin +imazethapyr 0.75 kg $ha^{-1}$ (PE) | 6.41 | 121.77 | 476.72 | 643.49 |
| Imazethapyr 100 g $ha^{-1}$ (PoE) | 29.18 | 231.05 | 823.82 | 1175.65 |
| Imazethapyr +imazamox 0.05 kg $ha^{-1}$ (PoE) | 30.39 | 211.18 | 770.32 | 1068.76 |
| Hoeing and weeding 25 DAS | 28.81 | 226.29 | 863.63 | 1270.01 |
| Weedy check | 29.97 | 503.31 | 1827.15 | 2492.74 |
| SEm± | 0.59 | 9.77 | 43.61 | 75.08 |
| CD (P=0.05) | 1.70 | 28.30 | 126.34 | 217.49 |
| SULPHUR LEVELS (kg $ha^{-1}$) | | | | |
| 0 | 24.61 | 257.71 | 912.04 | 1251.79 |
| 20 | 25.54 | 269.15 | 962.88 | 1339.45 |
| 40 | 24.70 | 265.50 | 982.06 | 1399.15 |
| SEm± | 0.45 | 7.57 | 33.78 | 58.15 |
| CD (P=0.05) | NS | NS | NS | NS |

PE= Pre-emergence, PoE= Post-emergence

### Effect on yield, net return and BC ratio

**Table 2:** Effect of weed management and sulphur nutrition on grain yield, net returns and BC ratio

| Treatments | Grain yield (kg $ha^{-1}$) | Net returns (₹ $ha^{-1}$) | BC ratio |
|---|---|---|---|
| WEED MANAGEMENT | | | |
| Pendimethalin +imazethapyr 0.75 kg $ha^{-1}$ (PE) | 697 | 41663 | 1.67 |
| Imazethapyr 100 g $ha^{-1}$ (PoE) | 562 | 29271 | 1.19 |
| Imazethapyr +imazamox 0.05 kg $ha^{-1}$ (PoE) | 580 | 31135 | 1.28 |
| Hoeing and weeding 25 DAS | 554 | 26510 | 1.00 |
| Weedy check | 417 | 17639 | 0.77 |
| SEm± | 18 | 1590 | 0.07 |
| CD (P=0.05) | 51 | 4607 | 0.19 |
| SULPHUR LEVELS (kg $ha^{-1}$) | | | |
| 0 | 500 | 23766 | 0.98 |
| 20 | 565 | 29423 | 1.18 |
| 40 | 621 | 34542 | 1.39 |
| SEm± | 14 | 1232 | 0.05 |
| CD (P=0.05) | 40 | 3569 | 0.15 |

PE= Pre-emergence, PoE= Post-emergence

The data presented in Table 2 reveal that all weed management treatments significantly increased grain yield of greengram over unweeded check. Critical examination of data further reveal that pre-emergence application of ready-mix of pendimethalin + imazethapyr observed with maximum grain yield (697 kg $ha^{-1}$) and eventually maximum net returns (41663 ₹ $ha^{-1}$) and BC ratio (1.67). This was attributed to minimum infestation of weeds (Table 1) together with lesser competition for other growth resources i.e. light, space, water, nutrients. Thus, reduced crop-weed competition resulted into overall improvement in crop growth which ultimately resulted into better development of reproductive structure and translocation of photosynthates to the sink. The data (Table 2) are indicative of the statistical superiority of sulphur application. Data show that with each successive increase in sulphur levels resulted significantly increase in grain yield over its preceding lower levels. The per cent increase in grain yield due to 40 and 20 kg S $ha^{-1}$ was 24.2 and 13.0, respectively compared to control. Further, application of 40 kg S $ha^{-1}$ recorded significantly the highest grain yield (621 kg $ha^{-1}$), net return and BC ratio. The role of sulphur can be described through its involvement in the primary and secondary metabolism as a constituent of various organic compounds that are vital for the functioning of plant processes. In general, increase in yield parameters of greengram with S application could be due to its role in improving mineral nutrition of the crop due to better root development. Sulphur also plays its role in N metabolism and supply of sulphur in adequate and appropriate amount helps in flower primordial initiation for its reproductive part, which govern number of pods plant$^{-1}$, length of pod, number of seeds pod$^{-1}$ (Dey and Basu, 2004) [1].

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