

Herbicide options for control of black pigweed in pigeonpea

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AT A GLANCE....

- Black pigweed is a troublesome weed in pigeonpea crops, and it could reduce the yield of pigeonpea significantly.
- Pre-emergence application of pendimethalin (450 g/L) at 2.0 litres per hectare reduced the biomass of black pigweed by 87 per cent and resulted in a 32 per cent increase in seed yield as compared to the untreated control.
- Post-emergence application of imazapic (240 g/L) at 437 ml per hectare reduced the biomass of black pigweed by 79 per cent and resulted in 60 per cent increase in seed yield as compared to the untreated control.

PIGEONPEA is familiar to many northern region growers as it is often used as a trap crop for insect management in cotton production. But outside of the north, pigeonpea (*Cajanus cajan*) is relatively unknown. On the international stage it is a much more prominent crop.

Pigeonpea ranks sixth in production of dryland legumes in the world and it is consumed by billions of resource poor farmers in the tropics, subtropics and semi-arid tropics, as a vegetable protein. The seed is eaten as a green vegetable or split dry grain popularly called 'dhal' which is a major supplement to energy rich cereal diets in a mainly vegetarian population.

The vegetative parts of the plant are rich in fibre and used as rations in stockfeed.

Being a legume, pigeonpea can fix atmospheric nitrogen for its own use as well as contribute some residual nitrogen (40–60 kg N per hectare) for the subsequent crop. The vigorous root system (up to two metres deep) of pigeonpea enables tapping of water and nutrients from deeper soil profile while sequestering carbon.



Black pigweed infestation in pigeonpea.



A luxuriant growth of pigeonpea. This field was treated with imazapic at 437 ml per hectare for excellent pigweed control.

Australian growers showing interest

In Australia, farmers have recently shown interest in growing pigeonpea as a food crop because of the high export price, and it is extremely productive under low soil moisture and fertility conditions.

Compared to other legumes, the relatively slow growth of pigeonpea keeps it at a competitive disadvantage against the rapid growth of summer weeds, particularly at early stages. Black pigweed (*Trianthema portulacastrum*) is one of the most troublesome weeds infesting a number of summer crops – including pigeonpea. Its high infestation in the field could reduce the seed yield significantly.

Earlier work suggests that the critical period of crop-weed competition in pigeonpea is up to six weeks and uncontrolled weeds during this period can reduce the seed yield of pigeonpea significantly. Choices of herbicides for weed control in broadleaf-pulse crops are limited, and soil moisture conditions in dryland limit the efficacy of pre-emergence herbicides.

Under these situations, use of post-emergence herbicides is one of the options that may be used as a sole treatment or in sequential spray after pre-emergence herbicides for alleviating the problem of weeds.

For post-emergence herbicides the major influences on effective weed control will be the dose and time of application, herbicide efficacy and crop growth stage.

A wrong choice of a herbicide and an overdose of post-emergence herbicides may cause phytotoxicity to the crop due to the juvenile nature of pigeonpea plants. The objective of our recent research was to evaluate the effects of pre and post-emergence herbicides on black pigweed suppression and seed yield of pigeonpea. Information generated from this study will help in registering effective herbicides for weed control in pigeonpea.



Weed control with pendimethalin in pigeonpea.



Toxicity of acifluorfen in pigeonpea.

How the research was done

A trial was conducted in 2017 at the Gatton research farm of the University of Queensland to evaluate herbicide options for the control of black pigweed in pigeonpea.

Twelve treatments comprising of different options for herbicides including untreated control (Table 1) were arranged in a randomised complete block design with three replications. The herbicides were applied using a CO₂-pressurised backpack sprayer equipped with flat-fan nozzles (AIXR 11002 TeeJet air induction flat-spray nozzles, TeeJet Technologies) delivering a water volume of 100 litres per hectare.

The pre-emergence herbicide (Stomp Xtra) was applied immediately after sowing, and post-emergence herbicides (Table 1) were applied 20 days after sowing. The crop was planted on February 8, 2017 using a germplasm line introduced from the International Crop Research Institute for the Semi-Arid Tropics (ICRISAT), at a seeding rate of 30 kg per hectare. The crop was planted at a row spacing of 50 cm with a tractor mounted planter and harvested on August 15, 2017.



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Pigeonpea crop at maturity.



Patchy crop stand in weed plots.

What we found

Among different weed control treatments, black pigweed biomass varied from 37–303 g/m², and it was highest in the weedy plots. The pigeonpea seed yield among different weed control treatments varied from 1.6–2.6 tonnes per hectare; lowest in weedy plots and highest in the plots treated with imazapic at 437 ml per hectare.

The pre-emergence application of pendimethalin either alone or in a sequential application with imazapic or betazon provided more than 80 per cent reduction in weed biomass as compared to the weedy plots (Table 1).

TABLE 1: Herbicides' effect on per cent reduction in biomass of black pigweed at 50 days after sowing and per cent increase in yield of pigeonpea as compared to the weedy plots (each value is an average of three replications)

Treatment	Reduction in weed biomass (%)	Increase in seed yield (%)
Weedy (untreated control)	—	—
Pendimethalin (450 g/L) 2.0 L/ha	81.4	31.7
Pendimethalin (450 g/L) 2.5 L/ha	87.1	26.4
Imazapic (240 g/L) 350 ml/ha	37.1	26.4
Imazapic (240 g/L) 437 ml/ha	79.0	59.9
Aciflurofen (224 g/L) 1.5 L/ha	37.8	9.2
Aciflurofen (224 g/L) 1.9 L/ha	70.2	8.4
Bentazon (480 g/L) 2.0 L/ha	30.6	19.4
Bentazon (480 g/L) 2.5 L/ha	38.8	30.0
Pendimethalin (450 g/L) 2.0 L/ha fb imazapic (240 g/L) 350 ml/ha	87.7	31.8
Pendimethalin (450 g/L) 2.0 L/ha fb aciflurofen (224 g/L) 1.5 L/ha	73.8	34.5
Pendimethalin (450 g/L) 2.0 L/ha fb bentazon (480 g/L) 2.0 L/ha	87.9	38.8

fb: followed by; DAP: days after planting; pendimethalin (Stomp Xtra); imazapic (Flame); aciflurofen (Blaze); bentazon (Basagran).

The post-emergence application of benatizon could not provide good control of black pigweed as weed biomass reductions varied from 31–39 per cent as compared to the untreated control.

The post-emergence application of imazapic at 437 ml per hectare resulted in a 60 per cent increase in seed yield of pigeonpea as compared to the weedy plots due to superior weed control and provided better growth to the crop (Table 1).

But the lower dose of imazapic (350 ml per hectare) was not found to be effective compared to the higher dose of imazapic and caused only 26 per cent increase in seed yield of pigeonpea as compared to the weedy plots.

The post-emergence application of aciflurofen caused phytotoxicity to the crop, so resulted in a small increase in yield (less than 10 per cent) as compared to the weedy plots.

The pre-emergence application of pendimethalin increased the yield of pigeonpea by more than 30 per cent as compared to the weedy plots.

To sum up

This trial suggests that the infestation of black pigweed significantly reduced pigeonpea seed yield. The post-emergence application of imazapic at 437 ml per hectare provided good control of this weed and resulted in a 60 per cent increase in yield as compared to the weedy plots.

The pre-emergence application of pendimethalin also provided good control of black pigweed and resulted in increased yield by greater than 30 per cent.

The results also revealed that the post-emergence application of aciflurofen caused phytotoxicity to the crop despite improved weed control.

The results suggest that if farmers are unable to apply pendimethalin as a pre-emergent in time for weed control – or if there is low efficacy of pendimethalin due to limited soil moisture – they could opt for the post-emergence application of imazapic at 437 ml per hectare for good control of black pigweed.

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