

FARM: Problematic weeds for low desert sorghum production and their management

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In many parts of the world, grain sorghum (*Sorghum bicolor* L. Moench) is a major crop for arid regions.

Sorghum has many uses. It is used as human food in many countries. Likewise, it is used as feed grain for poultry and livestock animals, and even used as forage or silage crops in many parts of the world. At present, grain and forage sorghums are minor crops in California's low desert region and are planted in small acreage. However, Sudangrass, a forage crop from the same family as sorghum, is planted in significant acreage as a summer crop. Like in other crops, pest infestation is one of the primary constraints for optimum harvest in sorghum crop production.

Weeds are a problematic pest for sorghum because they compete with the crop for nutrients, water, sunlight, and other resources essential for plant growth. The competition for resources eventually leads to yield reduction. Likewise, many weed species harbor disease and insect pests, and serve as a bridge for transferring these pests to the next season crop.

As we are having a potential threat from the sugarcane aphid in the low desert region, weeds such as johnsongrass or even volunteer Sudangrass can serve as host to this insect pest during a non-crop cycle. Weeds can produce high numbers of seeds and contribute to soil-seed bank where seeds may persist for several years.

Sorghum has relatively slow growth for about three to four weeks after planting.

During the early growth stage, sorghum is very susceptible to weed interference. Grass or broadleaf weed interferences for up to three leaf stage can reduce grain sorghum yield more than 20 percent and more than 10 percent, respectively. The season-long weed competition can reduce yield more than 50 percent in grain sorghum production.

Therefore, it is very important to maintain sorghum fields free of weeds for about four to six weeks after crop emergence, and until the crop grows through the head initiation stage in the case



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of grain sorghum. Weed control up to the head initiation stage is very critical in grain sorghum because a number of seeds/plant are set at this stage, and weed interference before this step can reduce the seed number.

Grain sorghum is competitive to weeds after the booting stage, and later emerging weeds have less impact on crop yield.

In the California low desert region, the most problematic weeds in sorghum include summer grasses. This is so because a majority of grass weeds in Imperial Valley are summer weeds, their life cycle coincides with sorghum crop season. Grass weeds such as johnsongrass (*Sorghum halepense*), volunteer Sudangrass (*Sorghum X drummondii*), barnyardgrass (*Echinochloa crus-galli*), jungle rice (*Echinochloa colona*), prairie cupgrass (*Eriochloa contracta*), and sprangletop spp. (*Leptochloa* spp.) are problematic for sorghum crops. Likewise, broadleaf weeds such as horseweed (*Conyza canadensis*), fleabane (*Conyza bonariensis*), common lambsquarters (*Chenopodium album*), nettleleaf goosefoot (*Chenopodium murale*), and pigweeds (*Amaranthus* spp.) that emerge during late spring or summer are also major weeds for sorghum crops in the low desert region.

Planting in a clean field is the first strategy for weed control in sorghum. Weeds could be cleaned with burndown herbicides or cultivation before planting. Preemergence (PRE) herbicides are the backbone for weed control in sorghum. Since the crop is susceptible to weed interference early in the season and there are very limited postemergence (POST) herbicides for grass weed control in sorghum, controlling grass weeds with PRE herbicides is very critical. PRE-herbicides are applied after planting sorghum and before seedling emergence. Atrazine could be applied PRE, and it is effective on multiple weed species with a more prolonged residual activity.

The herbicides from the Chloroacetamide family (Group #15) such as S-metolachlor or alachlor could be applied PRE for sorghum seed treated with safener (such as Concep or Screen). The combination products of atrazine and Chloroacetamide herbicides could be applied for control of most grass and broadleaf weeds before emergence.

POST herbicides could be applied to control broadleaf weeds. Currently, there are insufficient options for grass weeds control with POST-applied herbicides in sorghum. Herbicides such as 2,4-D, dicamba, carfentrazone, bromoxynil, and halosulfuron could be applied POST to control broadleaf weeds in sorghum production. Moreover, tank-mixing of multiple herbicide compounds should be considered depending upon weed spectrum in the field. Pendimethalin could be culti-sprayed after grain sorghum establishment, after the crop is 6-inches or taller (after 3 leaf stage). For culti-spraying pendimethalin, the field has to be cultivated before spray and grain sorghum root has to be covered by soil layer at least 1-inch or more to ensure that crop roots are not exposed to herbicide.

The pendimethalin should be applied as directed-spray at the base of the plant and row middles. Pendimethalin provides residual control for weeds emerging later in the season. When grass weeds infestation is severe, and harvesting operation is likely to be hampered, then paraquat could be applied in row middles with the hooded applicator in grain sorghum production. Late season paraquat application should be considered only as a rescue treatment because this practice can cause severe injury to sorghum crop.

Various factors to be considered for effective chemical weed control program in sorghum include:

- Weed identification: Weeds, especially grass spp., should be identified properly and appropriate herbicide should be applied for effective control.
- PRE and POST herbicides: Herbicide programs should consist of PRE- and POST-applied herbicides. For sorghum, PRE herbicides are effective for grass weed control and POST herbicides are effective for broadleaf weed control.
- Herbicide label: Herbicide label should be followed for rate and application timing (crop growth stage and weed stage). Herbicides should be applied at an appropriate rate based on the soil types.
- Spray water factors: Carrier water factors such as pH, hardness, and turbidity could influence POST herbicides activity. For enhancing herbicide performance, the water quality factors should be amended by using proper adjuvants.
- Herbicide carryover: Atrazine and chloroacetamide herbicide have longer residual effect and planting sensitive crop should be avoided after sorghum. Herbicide label should be followed for planting safe crop for the next season.

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