# Jamie L. Whitten Plant Materials Center

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## Harvest Aid Chemicals for Trailing Wildbean Production

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### ABSTRACT

Hopefield selection trailing wildbean [*Strophostyles helvula* (L.) Ell.] is a native legume that can be utilized in wildlife, critical area, and some pasture plantings. However, low seed production, indeterminate ripening, seed shatter, and physical interference from the vines all present seed production difficulties. Several types of harvest aid chemicals were tested to improve both seed yields and mechanical harvesting potential of this plant. The anti-shatter chemical Spodnam appeared to overcome the shattering problem, but seed yields were not significantly better than the control. The growth regulator Prep improved uniformity of ripening, but seed yield was lower than the control or the Spodnam treatments, although the differences were not significant. Yield of plants treated with the defoliant chemicals, Def 6 and Defol 6 were comparable to those of the Prep treatment. Seed yields for the Harvade treatment could not be determined, but it appeared to be similar in action to these two chemicals. None of these treatments provided any burn down effect on the vine. The desiccant treatments, Gramoxone, Ignite, and Roundup provided some burn down, but the vines were not completely killed and yields from all of these treatments were significantly lower than those of the previous treatments. Further research is needed to determine the potential for using the most promising of these chemicals or to examine other methods such as windrowing, companion crops, or clipping to improve commercial production of trailing wildbean.

### INTRODUCTION

Trailing wildbean is a native, trailing or twinning annual legume with trifoliate leaves. The purplish flowers, produced from July to September, form long, narrow pods containing numerous cylindrical, often mealy appearing seed that are favored by many species of birds (Graham, 1941; Radford et al., 1968). In 1997, the USDA-NRCS Jamie L. Whitten Plant Materials Center (PMC), Coffeeville, Mississippi released Hopefield selection trailing wildbean (accession 9021719) for use in wildlife and critical area plantings in the Southeast. It also has potential for use in pastures as a nitrogen producer (Lynd and Odell, 1983). Graham (1941) noted that trailing wildbean does not fruit heavily, which presents seed production problems for potential growers of this release. This plant also has several phenological and anatomical characteristics that further complicate mechanical harvesting of the seed that is produced. The flowering and fruiting pattern is highly indeterminate, which means that seed is not produced uniformly throughout the stand, and the pods shatter and forcefully expel the seed when ripe (Lynd and Odell, 1983). The vines also complicate harvesting because they trail along

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the ground and are difficult to feed into the combine; they are also very tough and wiry which causes them to wrap around and potentially stall the combine header.

Several types of harvest aid chemicals are used to improve harvesting characteristics of agronomic crops. Defoliants or desiccants are widely used on some species to remove the foliage or burn down (desiccate) other portions of the plant before harvest. Growth regulators can be used to improve uniformity of seed ripening and anti-shattering chemicals can be used to prevent seed dehiscence from early-maturing fruiting structures until harvesting operations can be completed. A study was conducted at the PMC to test the potential of various harvest aid chemicals to increase harvesting efficiency and improve yields of Hopefield selection trailing wildbean.

## MATERIALS AND METHODS

Scarified and inoculated seeds of Hopefield selection trailing wildbean were drilled in 40 inch rows on a field at the PMC with Oaklimeter silt loam soil in early to mid April of 1997 and 1998. The soil was limed to adjust the pH to 6.0 prior to planting. Phosphorous and potassium fertilizers were applied at rates of 13 and 25 pounds per acre, respectively. Dual (metolachlor) was applied for preemergence weed control after planting at a rate of 1.5 pounds active ingredient per acre (lb ai/A). Basagran (bentazone) and Poast Plus (sethoxydim) were used as needed for postemergence weed control at rates of 0.75 lb ai/A and 0.25 lb ai/A, respectively. In 1998, Scepter (acifluorfen) was applied at a rate of 0.125 lb ai/A in an attempt to control morning glories (*Ipomoea* sp. and *Jacquemontia* sp.). Concurrent research at the PMC showed that this herbicide, when applied to trailing wildbean seedlings, caused only moderate levels of foliar damage. However, this was determined fairly late in the summer, when flowers and young pods were present, and the herbicide caused significant damage to the developing fruit. The plants appeared to recover and produced many new flowers, but most pods were not able to ripen sufficiently to harvest before frost.

Treatment plots consisted of four rows (approximately 13.3 feet in width) 15 feet in length with 8 foot alleyways in a randomized complete block design with four replications. Percent stand ratings were taken before application of the harvest aid treatments to account for differences in plant populations between the plots. Harvest aid treatments and treatment rates are listed in Table 1. Treatments were applied to the plots using a $CO_2$ plot sprayer on October 8, 1997 and November 3, 1998. Application rates used were 20 gallons per acre (gpa) for all chemicals, except the two Spodnam treatments which were applied at a rate of 30 gpa as recommended by the manufacturer to ensure complete coverage of the pods. Plots were harvested on October 28, 1997. No seed could be harvested in 1998 because the herbicide treatment mentioned previously caused complete crop failure. Seed was harvested by hand from a ten foot section of the center two rows. All pods were harvested, including green ones. The pods were allowed to dry, thrashed in a small plot bundle thrasher, hand screened to remove larger pieces of trash and weighed. Notes were also taken on the apparent effect of the various harvest aid treatments on the vines. The seed yield data was subjected to an analysis of variance with plant stand ratings as a covariant. Treatment means were separated using a least significant difference test (LSD) at the five percent level of probability ($P \leq 0.05$).

Table 1. Trade and common names of harvest aid chemicals used, general chemical type, and rates applied.

| Trade Name | Common Name | Chemical Type | Rate |
|---|---|---|---|
| Gramoxone* | Paraquat | Desiccant | 1.0 lb ai/A |
| Prep | Ethephon | Growth Regulator | 1.0 lb ai/A |
| Def 6 | Tribufos | Defoliant | 1.5 lb ai/A |
| Ignite** | Glufosinate-ammonium | Desiccant | 0.75 lb ai/A |
| Spodnam | Spodnam | Anti-shatter | 0.75 pint/A |
| Gramoxone* + Spodnam | Paraquat + Spodam | Desiccant | 0.75 lb ai/A |
| | | Anti-shatter | 0.75 pint/A |
| Roundup | Glyphosate | Desiccant | 1.0 lb ai/A |
| Defol 6 | Sodium chlorate | Defoliant/Desiccant | 6.0 lb ai/A |
| Harvade*** | Dimethipin | Defoliant/Desiccant | 0.383 lb ai/A |
| Control | | | |

* Non-ionic surfactant added at a rate of 0.25% of volume.
** Non-ionic surfactant added at a rate of 0.5% of volume.
*** Applied in 1998 only with crop oil added at a rate of 2 pint/A.

## RESULTS AND DISCUSSION

The 1997 seed yields for each treatment are presented in Table 2. Seed yield was highest for the Spodnam only treatment; however, it was not significantly better than the control, where no chemicals were applied. The Spodnam treatment did appear to hold the pods together and prevent shattering before harvest. It is possible that this chemical could increase commercial yields of Hopefield selection. However, it is also possible that, because of the trailing habit of this plant, yields could also be decreased by damage from application equipment in the field, a point to consider for all treatments applied in this study. Also, Spodnam itself had no effect on the vines and yields from plots with the addition of a burn down chemical (Gramoxone) were very poor. Gramoxone, Roundup, and Ignite did the best job of burning back the vines. However, none of these treatments completely killed the vine to the base of the plant, so there would still be some level of interference with harvesting operations. The activity of these chemicals was probably reduced because pods ripen in the fall, when the plants are not actively growing. Seed yields from all of the desiccant treatments were significantly lower than the Spodnam treatment and the control. Yields from the Def 6 and Defol 6 treatment were lower than the Spodnam and control treatment but the difference was not significant. The foliage of trailing wildbean has generally senesced naturally by the time seed is harvested and neither chemical showed any activity on the vines, so it is questionable whether these defoliant-type chemicals would be useful for commercial production. Although yield data cannot be presented for the Harvade treatment applied in 1998, it appeared to have a similar effect on the plant as these two chemicals. The Prep treatment appeared to increase uniformity of pod ripening, but the yields from this treatment were still lower than the Spodnam or control treatments. It is difficult to make valid conclusions based on one year of data; however, with the disappointing results shown in 1997 and the crop failure in 1998, it was decided that it would be best to summarize the results and end this study. The most promising treatments (Spodnam and Prep) could undergo further testing to determine their suitability for trailing wildbean production. It might also be advisable to reexamine the use of desiccant chemicals, either subjecting the chemicals used in this test to further testing or to test others that might have the desired effect.

Table 4. Seed yield of Hopefield selection trailing wildbean treated with harvest aid chemicals in 1997.

| Chemical | Seed Yield |
|---|---|
| | (gram) |
| Gramoxone | 5.7 |
| Prep | 9.7 |
| Def 6 | 9.8 |
| Ignite | 3.1 |
| Spodnam | 16.4 |
| Gramoxone + Spodnam | 3.5 |
| Roundup | 5.8 |
| Defol 6 | 9.4 |
| Control | 15.1 |
| LSD (0.05) | 7.4 |

Although none of the harvest aid treatments used in this study appeared to improve yields or harvesting efficiency of Hopefield selection trailing wildbean, there are still additional methods that growers could investigate. One potential harvesting method would be to apply Spodnam to the pods to prevent shattering and then cut and windrow the plants prior to combining. This would allow the vines to die back and possibly prevent wrapping around the header. This method might still be subject to the application equipment problem mentioned previously, but may be desirable for large-scale producers. Another cultural technique that could be examined would be use of an upright companion crop for trailing wildbean to twine on, thereby lifting the vines off the ground, making field work and harvesting easier. This method has been used at the PMC for many years for 'Quail Haven' reseeding soybean (*Glycine soja* Sieb. & Zucc.) production. Research would need to be conducted to determine what types of companion plants would provide the desired support and not present any potential seed cleaning problems. Lynd and Odell (1983) reported that trailing wildbean responds to defoliation with vigorous regrowth. The plants might be easier to manage if they were clipped once during the growing season; however, the effects of clipping on seed production would need to be determined. Hopefield selection trailing wildbean is a native legume with many potential uses, but these seed production problems need to be overcome before it will become commercially available for widespread use.

**LITERATURE CITED**

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# NOTES