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'BEEWILD' BUNDLEFLOWER, A NEW SUMMER-GROWING PERENNIAL LEGUME FOR CENTRAL AND SOUTH TEXAS AND MEXICO

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Summary and Application

'BeeWild' bundleflower (*Desmanthus bicornutus* S. Watson) is the trademarked name of the mechanical blend of the four bundleflower cultivars 'BeeTAM-06', 'BeeTAM-08', 'BeeTAM-37', and 'BeeTAM-57' that were released by the Texas Agricultural Experiment Station (TAES) in 2003. The licensing agreement with Pogue Agri Partners permits the commercial sale of BeeWild but not the components. The components of BeeWild were developed at the Agricultural Research Station at Beeville with assistance from a number of others around the state and in Mexico. The lineage of all four lines traces back to material collected in Mexico by Australian plant collectors and have been under testing in Texas and Mexico for over a decade. BeeWild does best on high pH heavier soils, but there appears to be some variation among the four lines for soil adaptation. The summer growing perennial legumes that make up BeeWild have excellent drought tolerance, good seedling vigor, have a high level of hard seed, are excellent seed producers, and do not cause bloat. Forage nutritive value

analyses indicate that crude protein is near 20% and is low in fiber when compared to other species of summer growing legumes. BeeWild bundleflower has tannins, which likely accounts for the lack of bloat. We have tested this plant for grazing with both domestic livestock and wildlife, and it is palatable to cattle, goats, sheep, as well as white-tailed deer. Quail are frequently observed using plantings of bundleflower for cover, as the plant can grow to 9 feet tall and is open underneath for easy movement by the small birds.

Introduction

BeeWild bundleflower is adapted to central and south Texas and Mexico. The components of BeeWild have been under evaluation for nearly a decade and we have reported on it before as *D. virgatus* and *D. subulatus* (3, 7), all of which have been reclassified as *D. bicornutus*. The species is native to northern Mexico and the southern United States (5). There is no other commercial cultivar of this species of bundleflower currently available in the world. Other *Desmanthus* sp., however, have been released. Australian researchers

have released one line each of *D. virgatus*, 'Marc', *D. pubescens*, 'Uman' and *D. leptophyllus*, 'Bayamo' (1, 2), and in Texas, 'Sabine' Illinois bundleflower (*D. illinoensis*) was been released by Soil Conservation Service (8) (Note that most of the literature, including the official release documents on the three Australian cultivars identifies all as *D. virgatus*.) Of the Australian releases, Bayamo is the best adapted to South Texas, but it will not persist more than a couple of growing seasons. Marc usually dies by the middle of the first summer, while Uman will not flower and produce seed most years, and lacks winter hardiness in all but our mildest winters. Sabine Illinois bundleflower is not adapted to South Texas at all and it is rare that we can even get a stand under the best of conditions.

It is interesting that of the four lines we have identified as worthy of release in South Texas, three of these have been independently identified by Chris Gardiner (personal communications, 2002) of James Cook University in Townsville, Queensland, Australia as survivors from abandoned nurseries in Australia. In those environments, they have survived extreme droughts, uncontrolled grazing by cattle and wildlife, and have persisted for a decade or more.

Methods and Materials

A series of experiments have been conducted over a broad array of conditions to evaluate the potential range of adaptability as well as the strengths and weaknesses of this new legume. The initial screening of some 40 plant introductions was done at TAES-Beeville. To be

considered for further evaluation, plants in the initial 2-replication nurseries had to



Photo shows flowers and immature pods on one of the lines of BeeWild.

survive the winter, produce a plant with a good "forage potential" and "seed production potential" rating from visual evaluation, and have adequate seedling characteristics to produce a reasonable stand of seedlings in the mowed vegetation that grew between the rows.

The second set of evaluations consisted of growing seedlings of the best 10 or so lines in the greenhouse and transplanting them into the field at Kingsville, Beeville, Uvalde, Yoakum, Luling, College Station, and Stephenville. Following this set of tests, we initiated seed increases of the selected lines at Beeville and made our first attempt to quantify seed production potential. These experiments were not replicated, but were

isolated rows of greenhouse-grown plants set out in 3 100-foot-long rows of each selection. This produced enough seed to expand our evaluations and initiate additional seed increases.

Wildlife forage research followed for multiple years on private ranches. We completed two years of research using replicated plantings of our bundleflowers compared to a number of other plants (mostly legumes) that are being used or were suggested as suitable for use to enhance the nutrition and growth of white-tailed deer in South Texas (4). These plots were irrigated and planted in each of two replications each year (new wildlife forage areas each year). Plots were monitored and sampled periodically for yield and forage nutritive value evaluations as well as periodic nighttime observations as to deer utilization. Following this set of experiments, we expanded our work to a second ranch where we made further observations on establishment and deer use.

Simultaneously with some of the above research and evaluations, we distributed 5-lb lots of seed to more than 30 cooperators from near the Louisiana boarder on the east, to near Uvalde on the west, as far north as southern Oklahoma, and south into Mexico. We also established a seeding rate and P-fertilizer rate study, along with typical variety-trial type forage production studies using a constant seeding rate. A series of studies were conducted to evaluate potential use of selective herbicides. Once we identified useful, non-phytotoxic herbicides, some of these were routinely used to help control weeds in some of our other research efforts.

Results and Discussion

The initial screening performed at TAES-Beeville identified 6 or 7 lines as

worthy of further evaluation. But when put in the multi-location evaluation test along with the three cultivars from Australia and Sabine Illinois bundleflower, we soon narrowed the field to the four lines that now make up BeeWild. The four lines performed well at all but the two northern sites of College Station and Stephenville. Survival of individual spaced plants exceeded 80% for all the southern sites. In Stephenville, subsequent plantings of BeeTAM-06 survived three years under irrigation but have suffered winter-kill in dryland conditions. In the College Station area, subsequent plantings have performed well. We suspect that the first planting may have performed poorly because of being transplants instead of direct seeding.

Even though none of our seed production data is from replicated trials, all our selections proved to be very good seed producers in both small plots and in 2 to 10 acre plantings. BeeTAM-57 is the earliest to flower, has the largest seed, but the stems are larger than all the other lines. BeeTAM-06 has proven to be the best seed producer, but is late flowering and has the smallest seed size. The other two lines flower similarly to BeeTAM-06, but BeeTAM-37 has seed that is intermediate to BeeTAM-06 and BeeTAM-57 in size. BeeTAM-06 and BeeTAM-08 have similar seed size; however, BeeTAM-08 is not as tall as BeeTAM-06. BeeTAM-08 also seems to be better adapted to some of the lighter soils. The seed size and flowering time differences allow for different patterns of forage and seed shattering to provide for a continuous supply of seed and forage for game birds and herbivores.

Our wildlife forage research indicated that BeeWild bundleflower is about equal to lablab and cowpeas in terms of forage nutritive value traits, and that the forage

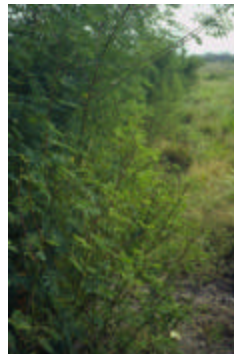
crude protein content runs from in excess of 20% in the early summer to about 17% in the late summer/early fall (4, 7). Acid detergent fiber and neutral detergent fiber analyses of leaves and tender stems (not the thicker stems that develop as the plant matures) indicate that BeeWild is lower in fiber content than nearly all other legumes we compared. Calcium and phosphorus levels in the tissue were consistently low compared to the other legumes. BeeWild has tannins, but the levels are not high enough to prevent utilization of the plant, and may contribute to rumen bypass protein. We have noted that, during severe drought stress, livestock and wildlife did not overuse the forage, so perhaps the tannin is at a level adequate to prevent overuse during stress. We have never observed any bloat with BeeWild, and likely the tannin is precipitating the soluble proteins in the rumen and preventing bloat.

Our seeding rate experiments suggest that BeeWild has near maximum yield potential at a seeding rate near 3 lbs. per acre (scarified seed). Dry matter yield ranges from about 4000 to nearly 7000 lbs. per acre, depending on rainfall and soils. Some of this biomass, however, will not be useful to the grazing animal as the larger stems are rejected. We do not believe BeeWild would make a good hay crop. Our P-response study conducted at TAES-Beeville gave no response to added P₂O₅ fertilizer at the 40 and 80-lb. rates compared to no fertilizer, even though the soil test level of P was low. However, we think this needs further evaluation before we conclude that BeeWild does not respond to P fertilizer.

From our work with herbicides, we feel confident that all the selective grass killers show no phytotoxicity to BeeWild bundleflower at any stage in the

development from new seedlings to mature plants. We have confirmed from some Australian work that Pursuit is safe on bundleflower as long as you avoid spraying from two weeks pre-plant to about 4 to 6-inch stage on the bundleflower. The one herbicide that is labeled for bundleflower, Plateau, is NOT safe on BeeWild or Sabine Illinois bundleflower seedlings and will no longer be available to the public beyond 01.15.04.

All lines perform best on heavy textured soils, but we have some evidence that suggests that BeeTAM-06 and BeeTAM-08 may be better adapted to lighter textured soils. However, none do well on sandy soils. And since our environment in central and south Texas and in Mexico is so variable in rainfall, soil type, and a number of other site attributes, we believe planting BeeWild, which is a blend of all four cultivars, is more desirable than trying to target a different line for different site conditions.



Photo's show extremes in deer use patterns. Upper photo: Deer selectively browsed-off

some of the tender shoots. Lower photo: Deer consumed everything green within reach.

Conclusions

General management recommendations for BeeWild are as follows: It is best adapted to high pH, calcareous soils from central Texas southward into Mexico. We have not evaluated it in other southern states, but likely there will be some sites in the lower southeastern U.S. where they will perform well. Optimum seeding time will vary with location, but BeeWild bundleflower likes hot weather, and planting too early in the spring may result in reduced competitiveness with weeds. In central and south Texas, April and May will be the best time to plant, but we have successfully seeded into mid-to-late summer with irrigation. We have not documented any response to P fertilizer, but more research is needed on this subject. The seed is sensitive to depth of planting, and many of our most successful plantings have come from broadcast planting on prepared seedbed. The target planting depth should be about 1/4 inch. Planting into sod has received less attention, but with adequate sod suppression we have been successful in getting a stand (6); and once you get a stand, BeeWild will compete with most grasses. The number of plants required per square yard to obtain a stand has not been determined, but since BeeWild is a small shrub-like plant, it should only take 1 to 5 plants per square yard to be a full stand. This can be obtained with a seeding rate of 3 to 5 lbs./acre. It appears that high seeding rates may in fact deter utilization by white-tailed deer. Some plantings we made with up to 10 lbs. of seed per acre required thinning to enable deer to penetrate into solid stands of bundleflower. If stands appear to be too thick, consider

using mechanical or chemical procedures to modify the stand density. Disking of mature stands of BeeWild often kills less than half the plants, but disking in strips may be a safer approach. We have found that the woody tissue should be cut off during the cool part of the season to facilitate the growth of winter legumes with the bundleflowers in the winter and spring. The stems of this plant are quite stiff and can penetrate tires. To minimize this damage, we recommend that a stubble height of about 1 foot or more be left; thus, when you drive over the plant, it tends to bend over rather than penetrate the tire. When the seed is allowed to mature normally, hard seed content is very high (90% or more). As with most forage plants, however, all the seed does not mature evenly, so commercial seed may have lower hard seed contents. In addition, most commercial seed will be sold as scarified seed. We think there may be a place to market a blend of scarified and non-scarified seed, so that there is about 25 to 35% hard seed in the marketed seed. The greatest interest in this legume currently is for wildlife forage and habitat, but it also has great potential as a quality forage for grazing livestock. We have no documented research that BeeWild bundleflower is good quail habitat, but almost every planting of the BeeWild bundleflower we have made, as well as a large number of reports from landowners, indicated that BeeWild provides excellent habitat for quail. Likewise, we think that the seed may be a good food source for many game birds, but research is needed to verify these observations.



Photo: Mature pods of BeeWild.



Photo: Bob white quail using BeeWild for cover.

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