



Kika de la Garza Plant Materials Center

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EVALUATION OF SIXTEEN ACCESSIONS OF ORANGE ZEXMENIA

ABSTRACT

Sixteen accessions of orange zexmenia (*Zexmenia hispidia*), formerly known as hairy wedelia (*wedelia hispidia*), were evaluated at Kika de la Garza Plant Materials Center in Kingsville, Texas beginning in 1994. An initial evaluation plot was planted at the center in 1994, and was evaluated by Center staff for four years. Accessions were rated on both vegetative production and seed production, as well as survival. In addition, some seedheads were hand-harvested, and the average number of seeds per head was calculated because it appeared that some accessions produced more seeds per head than others. A series of germination tests were also conducted. In the fall of 1998, four accessions were selected as superior and will be combined as a composite that will be released by the Center.

INTRODUCTION

Orange zexmenia (*Zexmenia hispidia*), also known as hairy wedelia (*Wedelia hispidia*), is a common, native, warm-season, perennial forb (Ajilvsgi, 1991). A member of the sunflower (Compositae) family, it grows approximately 24 to 30 inches tall blooming from March to December (Jones, 1982). Its shrub-like form, bright yellow-orange flowers, and hardiness in both dry and moist conditions make it an attractive plant for landscape use. In addition, it is easily cultivated, and is often browsed by deer, sheep, and goats (Ajilvsgi, 1991). It is found in parts of Texas and Mexico. In Texas, it is found along the Edwards Plateau, the Rio Grande Plains, and less frequently in the Trans Pecos, and in the southern portions of north central and south east regions of Texas (Correl & Johnston, 1996).

An Initial Evaluation Plot (IEP) containing 2 replications of 16 different accessions of orange zexmenia was planted at Kika de la Garza Plant Materials Center on 4/12/94. The plot was evaluated for four years for characteristics such as survival, plant vigor, vegetative production, seed production, and uniformity. In the fall of 1997, PMC staff began to rank the accessions based on vegetative production and seed production at the end of each growing season. In addition, three germination tests were conducted. The objective of collecting the wide range of data on the sixteen orange zexmenia

accessions was to select a superior accession or composite several superior accessions for release as a perennial shrub for wildlife use in Texas.

MATERIALS AND METHODS

The materials consisted of sixteen accessions from an original collection of orange zexmenia seed harvested in the early 1990s from various locations in Texas. Three accessions were harvested in 1990: #9055784 (Comal, TX), #9061260 (Goliad, TX), and #9061281 (Eldorado, TX). Seven accessions were collected in 1991: #9064342 (Gonzales, TX), #9064351 (Sequin, TX), #9064353 (Burnet, TX), #9064356 (Hondo, TX), #9064357 (Austin, TX), #9064358 (Lockhart, TX), and #9064359 (Lockhart, TX). Four accessions were collected in 1992: #9064386 (Gonzales, TX), #9064414 (Cuero, TX), #9064421 (Sanderson, TX), #9064423 (Goliad, TX). The last two accessions were harvested in 1993: #9064437 (Bandera, TX) and #9064456 (Goliad, TX). In addition, seed and seed heads harvested in spring of 1998 from an Initial Evaluation Plot composed of the above sixteen orange zexmenia accessions was also used in the evaluation process.

In January of 1994, 42 accessions of orange zexmenia were planted in the greenhouse at Kika de la Garza Plant Materials Center at Kingsville, Texas. The sixteen best accessions with the best germination/emergence percentage were transplanted into an initial evaluation plot located in Block D at the PMC in April of that same year. The plot consisted of two replications of 10 plants of each of the sixteen accessions. The plants were transplanted into 16 ten-foot sections of bedded rows for each replication. The location of each accession within a replication was chosen randomly. The final plot was eight rows wide and four ten foot sections long, with a five-foot alley separating the row sections. The sides of the plot were flanked by border rows of orange zexmenia. The plot was irrigated as necessary to establish the plants. The plot was evaluated for four years before being removed.

Three germination tests were conducted. The initial test was conducted from January to March of 1994 and was rather informal. It was conducted using seeds from the original collection packets planted in the greenhouse at Kika de la Garza Plant Materials Center. Temperatures ranged from 50°f to 85°f, with approximately 10 hours of daylight and fourteen hours of darkness. Seeds were planted in mid-January, and final evaluation was made in early March. Average germination was recorded for each accession. The purpose of this test was to determine accessions with the highest percentage of germination.

The second germination test was conducted from May of 1998 at Kika de la Garza Plant Materials Center. Seed from the original collection packets was used, but this time, the test was conducted in a controlled germination chamber. Fifty untreated seeds of one accession were evenly distributed on two sheets of blotter

paper stacked one on top of the other, and placed in plastic boxes, with tight fitting lids. The blotter paper was moistened with de-ionized water, and remoistened with de-ionized water when necessary. The process was repeated with each accession. The test was replicated three times. Eight accessions were tested at a time. The first set of eight was tested for fourteen days; then the second set was tested for the next fourteen days. During each test period, twenty-four plastic boxes, each containing one of eight accessions were placed in a randomized design on one of four shelves in a controlled environment chamber. Temperatures were set at 20°C for twelve hours of darkness and 30°C for twelve hours of light. Boxes were checked daily and germination was recorded. On the fourteenth day, the three replications of each accession were averaged, and a mean germination percentage for the accession was recorded. The purpose of this test was to evaluate the germination of the sixteen accessions of orange zexmenia in a more controlled setting, in order to determine the accessions with the highest percentage of germination.

The third germination test followed the same procedures used to conduct the second germination test. This third test was conducted in October and November of 1998, and used seed of each accession that had been harvested from the orange zexmenia IEP in Block D at the center. The purpose of this test was to evaluate seed from plants that had been exposed to the same conditions in order to determine the accessions with the highest germination percentage. It provided a chance to evaluate germination in seed harvested from the original planting. The two previous tests had evaluated seed harvested from the original collection sites which were at different locations and in different years.

Although seed production had previously been evaluated based on the number of heads produced. It had been noticed that seed heads harvested from some accessions of orange zexmenia seemed to contain more seeds than seed heads harvested from other accessions. In May of 1998, seed was collected from each accession in both replications of the IEP in Block D. Ten seedheads of average size for each accession/replication combination were selected, and the number of seeds contained in each seed head was counted. A mean number of seeds per seedhead was calculated for each accession.

In the fall of 1997, PMC staff began to rank the sixteen accessions of orange zexmenia based on vegetative production and seed production. Weekly evaluations were made. Each replication of each accession was rated on a scale of 1-9 for vegetative production and seed production, with 1 being the best rating. At the end of the season, the ratings for each trait for each accession were totaled and a score was obtained. The accessions were then ranked from 1 to 16 with those accessions with the lowest scores receiving the best (lower numbered) rankings. The ranking system was repeated for the spring 1998 and fall 1998 growing seasons. The rankings were then combined in the fall of 1998 to obtain one 18-month ranking for each trait and an over-all rank for both traits combined. The purpose of the ranking system was to find an organized method of evaluating

accession performance because initial data collection found all of the sixteen accessions to produce adequate vegetative growth and seed. It was hoped that a more quantitative system would make it easier to reduce the number of accessions under consideration for release. The sixteen accession's germination averages for each germination test, a combination of the three germination averages, and the number of seeds per seedhead means were also ranked with the lower numbered ranks being the best. The ranking data was then compiled into a chart format.

RESULTS AND DISCUSSION

All calculations were done by PMC staff using a hand calculator. Results to be discussed include the vegetation production and seed production rankings, the results of the three germination tests, and the results of the seeds per seedhead evaluation. All single season vegetative production and seed production rankings are contained in Table 1. All germination percentages and rankings are contained in Table 2. All cumulative vegetative production, seed production, and germination rankings are contained in Table 3., along with the seeds per seedhead data and rankings.

Vegetative Production

The sixteen accessions of orange zexmenia were ranked for vegetative production at the end of the fall 1997, the spring 1998, and the fall 1998 growing seasons. It should be noted that all sixteen accessions had good vegetative production, so a poor ranking does not indicate poor production. Rankings were only used to evaluate the accessions relative to each other, and often there was not a big difference in vegetative production between the top-end and bottom-end ranks. The top four vegetative producers for the fall 1997 growing season were accessions # 9064456, 9064437, 9064421, and 9064358. For the spring 1998 growing season, the top four vegetative producers were #9064414, #9064456, #9064342, and #9064356. The top four producers for the fall 1998 growing season were #9064342, #9055784, #9064414, and #9064356. The top four vegetative producers over the three growing seasons were #9064414 (Cuero), #9064456 (Goliad), #9064342 (Gonzales), and #9064358 (Lockhart).

Seed Production

The sixteen accessions of orange zexmenia were ranked for seed production at the end of the fall 1997, the spring 1998, and the fall 1998 growing seasons. Seed production was evaluated using ocular estimation of the number of seed heads per plant. It should be noted that all sixteen accessions had good seed production, so a poor ranking does not indicate poor production. Rankings were only used to evaluate the accessions relative to each other, and often there was not a big difference in seed production between the top-end and bottom-end ranks. The top four seed producers for the fall 1997 growing season were #9064437, #9064456,

#9064421, and #9064358. For the spring of 1998, the top seed producers were #9064414, #9064342, #9064456, and #9064386. The top seed producers for the fall 1998 growing season were #9064353, #9064357, #9064359, and #9061281. The top four seed producers for the three growing seasons combined were #9064437(Bandera), #9064358 (Lockhart), #9064456 (Goliad), and #9064357(Austin).

Germination

For the first germination test, conducted from January to March of 1994 with seed from the original collection, germination ranged from a high of 36% to a low of 5%. Five accessions had 20% germination or better. Accession #9064437 had the highest germination percentage with 36% germination. This was followed by accession #9064456 with 24% germination, #9064423 with 23% germination, #9064386 with 21% germination, and #9064358 with 20% germination.

The second germination test was conducted in May of 1998 and also used seed from the original collection. For this test, germination ranged from a high of 35% to a low of only 1%. This time, six accessions exceeded 20% germination or better. Accession #9064437 again had the highest germination of all the accessions tested with 35% germination. This was followed by accession #9064353 with 33% germination, #9064358 with 27% germination, #9064423 with 23% germination, and accession #s 9064421 and 905260 – both with 21% germination.

The third germination test conducted in the fall of 1998 used seed harvested from the IEP in Block D in the spring of 1998. Germination percentages were much higher for this test, with all accessions exceeding 20% germination. For this third germination test, germination ranged from a high of 73% germination to a low of 22% germination. Seven accessions had 60% germination or better and two accessions exceeded 70% germination. The top two accessions were #9061281 and #9064356 with 73% germination and 71% germination, respectively. They were followed by accession #9064359 with 67% germination, #9064351 with 65% germination, #9064437 with 64% germination, and accession #s 9064353 and 9064358 with 60% germination. When the germination results were combined, the following four accessions were ranked the highest: #9064437 (Bandera), #9064358(Lockhart), #9064359(Lockhart), and #9064353 (Burnet).

Seeds per Seedhead

The average number of seeds per seed head per accession was arrived at by selecting 10 average-sized seed heads from each accession/replication combination for a total of twenty seedheads. Seeds from each seedhead were counted and recorded, and an average was calculated for each accession. The average number of seeds per seedhead ranged from a high of 21.4 seeds to a low of 13.8 seeds per seed head. Six accessions were found to average 20 seeds

per seedhead or better. These accessions were #9055260 (Goliad) with 21.4 seeds per seedhead, #9064358 (Lockhart) with 21.1 seeds per seedhead, #9064351 (Seguin) also with 21.1 seeds per seedhead, #9064437 (Bandera) with 21 seeds per seedhead, #9064421 (Sanderson) with 20.7 seeds per seedhead, and # 9064359 (Lockhart) with 20.2 seeds per seedhead.

Discussion

It was decided in the spring of 1998 that a release of orange zexmenia should be a composite. This decision was made for several reasons. First, no one accession really stood out as being consistently the best. Second, orange zexmenia grows in a wide variety of climates and terrains within Texas. A composite would provide a better chance of adapting to a broad range of situations than would any single accession. Third, even among accessions that were good, there often seemed to be some area of performance where they were lacking. For example, accession #9064414 ranked #1 for over-all vegetative production and #5 for seed production based on the number of heads. Yet, it had the lowest number of seeds per head and the poorest germination of any of the accessions.

We began to sort the accessions into groups by region. It was decided that one accession would come from a more northern collection site, one from a more easterly collection site, one from a southern collection site, and one from a westerly collection site. After evaluating all the collected data and the rankings, three accessions stood out as having excelled in at least three categories: #9064358 (Lockhart), #9064437 (Bandera), and #9064456 (Goliad). With those three accessions, we felt we had covered the northern, eastern, and southern growing areas. We then focused on the accessions from western Texas. There were only two to choose from: #9061281 (Eldorado) and 9064421(Sanderson). Neither had real standout performance, but #9061281 had the highest germination of any accession in the third germination test with 73%, whereas #9064421 had only 48% germination in the same test. We chose accession #9061281 for the western collection site selection. The Kika de la Garza PMC will release accession #9076938, once the seed supply has been increased to an adequate amount. The release will consist of a composite of accessions # 9061281, #9064358, #9064437, and #9064456.

REFERENCES

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Correll, D. S., and Johnston, M.C., (1996). Manual of the Vascular Plants of Texas. Richardson, TX: The University of Texas at Dallas.

Jones, F. B., (1982). Flora of the Texas Coastal Bend. Sinton, TX: Welder Wildlife Foundation.

Table 1.**Vegetative Production and Seed Production Rankings for
Orange Zexmenia From Fall 1997, Spring 1998. And Fall1998**

ACC #	Location	Rank Veg. F 97	Rank Seed F 97	Rank Prod F97	Rank Veg. S 98	Rank Seed S 98	Rank Prod S98	Rank Veg. F98	Rank Seed F98	Rank Prod F98
260	Goliad	11	11	12	6	11	6	14	11	14
281	Eldorado	7	9	7	15	14	16	12	4	7
342	Gonzales	8	12	9	3	2	2	1	9	3
351	Sequin	14	15	15	14	9	12	11	15	16
353	Burnet	16	16	16	9	15	14	9	1	4
356	Hondo	9	8	8	4	13	7	4	5	1
357	Austin	13	7	10	8	10	9	13	2	6
358	Lockhart	4	4	4	5	5	4	5	8	5
359	Lockhart	10	13	11	13	8	11	6	3	2
386	Gonzales	15	10	13	16	4	10	16	6	13
414	Cuero	5	6	5	1	1	1	3	13	9
421	Sanderson	3	3	3	10	16	15	15	7	12
423	Goliad	6	5	6	11	12	13	10	16	15
437	Bandera	2	1	2	12	6	8	8	10	10
456	Goliad	1	2	1	2	3	3	7	12	11
784	Comal	12	14	14	7	7	5	2	14	8

Table 2.

**Orange Zexmenia Germination Percentages and Rankings
For January 1994, May 1998, and October 1998**

ACC #	Location	Germ % 1/94		Seed Yr. Used	Germ % 5/98		Seed Yr. Used	Germ % F 98		Seed Yr. Used
260	Goliad	16	7	90	21	5	90	54	9	98
281	Eldorado	9	11	90	10	12	90	73	1	98
342	Gonzales	9	11	91	14	10	91	38	14	98
351	Sequin	13	8	91	11	11	91	65	4	98
353	Burnet	11	10	91	33	2	91	60	6	98
356	Hondo	8	14	91	8	14	91	71	2	98
357	Austin	5	16	91	9	13	91	51	10	98
358	Lockhart	20	5	91	27	3	91	60	6	98
359	Lockhart	18	6	91	17	8	91	67	3	98
386	Gonzales	21	4	92	7	15	92	30	15	98
414	Cuero	13	8	92	1	16	92	22	16	98
421	Sanderson	7	15	92	21	5	92	48	12	98
423	Goliad	23	3	92	23	4	92	50	11	98
437	Bandera	36	1	93	35	1	93	64	5	98
456	Goliad	24	2	93	18	7	93	40	13	98
784	Comal	9	11	90	15	9	90	55	8	98

Table 3.

**Over-all Rankings and Seeds per Seedhead
Data and Rankings for Orange Zexmenia**

ACC #	Location	Rank Germ Combo	Rank Veg. Combo	Rank Seed Combo	Rank Prod Combo	Avg # Seeds/ Head	Rank Seeds Head
260	Goliad	6	11	13	14	21.4	1
281	Eldorado	9	12	11	12	19.4	8
342	Gonzales	14	3	7	5	17.8	10
351	Sequin	8	15	16	16	21.1	3
353	Burnet	4	14	12	15	18.1	9
356	Hondo	11	5	10	6	17.5	12
357	Austin	15	13	4	7	17.6	11
358	Lockhart	2	4	2	2	21.1	2
359	Lockhart	3	10	8	8	20.2	6
386	Gonzales	13	16	6	13	16.1	13
414	Cuero	16	1	5	3	13.8	16
421	Sanderson	12	9	9	9	20.7	5
423	Goliad	5	8	14	11	15.3	14
437	Bandera	1	7	1	4	21.0	4
456	Goliad	7	2	3	1	14.2	15
784	Comal	10	6	15	10	19.7	7

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