Comparing persistence and fecundity of Florida-ecotype and non-Florida-ecotype wildflowers

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APPROXIMATE CONVERSIONS TO SI UNITS

SYMBOL	WHEN YOU KNOW	MULTIPLY BY	TO FIND	SYMBOL
LENGTH				
ft	feet	.0305	meters	m
SYMBOL	WHEN YOU KNOW	MULTIPLY BY	TO FIND	SYMBOL
AREA				
ac	Acres	0.405	Hectares	Ha
SYMBOL	WHEN YOU KNOW	MULTIPLY BY	TO FIND	SYMBOL
MASS				
lb	pounds	0.454	kilograms	kg

Table 1-1 SI (MODERN METRIC) CONVERSION FACTORS*

1. Report No.	2. Government Accession No.	3. Recipient's Catalog No.
4. Title and Subtitle Comparing persistence and fecundity of Florida-ecotype and non-Florida-ecotype wildflowers		5. Report Date April 2017 6. Performing Organization Code
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16. Wildflower plantings by Florida DOT have long shown inconsistency in establishment from one site to the next. One theory for this was that the wildflower seed was predominantly purchased from the western plains states, thus not well adapted to the sub-tropical climate of Florida. An effort was initiated to select hardy plants that were adapted to FL conditions and call them “Florida-ecotype” or “Florida grown” seed. However, Florida grown seed are more expensive to purchase and often more difficult to procure. Therefore, it was later questioned if Florida grown seed are essential for new wildflower plants. Therefore, experiments were established in the fall of 2014 at Citra and Ona FL to test golden tickseed and partridge pea that were procured as both Florida grown and from western retailers. Regardless of seed origin, establishment was low and rather inconsistent. Even in plots where establishment did occur, partridge pea failed to produce viable seed in either location. Though golden tickseed did produce seed, germination was less than 40% for either seed source. In 2016, recruitment of new plants was almost non-existent for either species. By spring 2017, no new seedlings were observed in any site at either location. Because of the failure of the Florida grown and western grown seed, it is difficult to determine if either source is superior, or different in any way from the other.

17. Key Word	18. Distribution Statement
Wildflower Florida ecotype	No restrictions

19. Security Classif. (of this report)	20. Security Classif. (of this page)	21. No. of Pages	22. Price
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Executive Summary

Experiments were established in the fall of 2014 at Citra and Ona FL to test golden tickseed and partridge pea that were procured as both Florida grown and from western retailers. The two ecotypes were planted over 500 m apart to prevent possible movement of pollen from one ecotype to the next. Plots were then regularly checked for number of plants recruited from one year to the next and seed were harvested and germination analyzed. Regardless of seed origin, establishment was low and rather inconsistent. Even in plots where establishment did occur, partridge pea failed to produce viable seed in either location. Though golden tickseed did produce seed, germination was less than 40% for either seed source. In 2016, recruitment of new plants was almost non-existent for either species. By spring 2017, no new seedlings were observed in any site at either location. Because of the failure of the Florida grown and western grown seed, it is difficult to determine if either source is superior, or different in any way from the other.

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Introduction

The Florida wildflower program started in 1963 and has been a highly visible and popular program ever since. Though the program started by planting various clovers, it quickly expanded to include numerous other species. But after many years of seeding wildflowers throughout Florida, it was found that some plantings were highly persistent and successful while others would fail completely. One theory to address this lack of performance was that the majority of seed was purchased from vendors from Texas and other western states. The fact that these seeds were derived from plants growing in vastly different climates than Florida lead researchers to suspect that these flowers were specifically adapted to the dryer western climates. Since these flowers were highly productive in the West could likely explain why many of them could not tolerate the sub-tropical environment of Florida.

A cooperative of Florida wildflower growers was formed in 2003 to select the most successful flowers currently growing in the state. It was believed that these individual plants had become adapted to Florida conditions and would produce offspring that would likewise perform. These selections are called ecotypes. Therefore, the Florida cooperative began growing and selling "Florida ecotype" or "Florida-grown" wildflower seed for the establishment of new plantings.

Though these new plantings have performed well, failure of new plantings still occur. Moreover, specifically purchasing "Florida grown" seed can cost significantly more than comparable seed grown in other states. It is currently unknown if Florida wildflower seed is significantly different. It is important to understand if Florida ecotypes are truly superior so that additional emphasis can be placed on acquiring these seed for all new plantings. These data will potentially benefit FDOT in two ways: 1) if few differences exist between ecotypes, lower cost seed can be purchased and lead to a savings to maintenance unit, 2) if few difference are found, non-Florida ecotype seed are easier to procure through commercial vendors making seed availability less difficult.

Project Objective(s)

1. Compare the establishment and persistence of 2 species of Florida and non-Florida grown wildflower seed.
2. Compare seed quality (germination) from Florida and non-Florida grown seed.

Methods

Two species of wildflower were planted at two locations, Ona, FL and Citra, FL, in October of 2014. The species selected are: partridge pea (*Chamaecrista fasciculate*) and golden tickseed (*Corepsis basalis*) - each of which were obtained from a Florida-grown and a non-Florida vendor. These species were seeded into existing bahiagrass that was prepared to simulate a

roadside environment. The plantings were replicated 3 times at each site so statistical comparisons can be made. However, a Florida and non-Florida ecotype, of similar species, were not be grown within 500 meters of each other. This was to minimize the likelihood of cross-pollination and transfer of genes from one ecotype to another. After flowers had produced seed and matured, the plot areas were regularly mowed to simulate highway maintenance.

In April of 2015, a one meter square was placed in each plot to count the number of plants that had emerged and established. In May 2015, these plots were visited and seed were collected. These seed were then sent to the Iowa State Seed Lab for analysis of percent germination. This was to document seed quality from both Florida and non-Florida grown parent plants.

Discussion

Plots were established in early October 2014 using two ecotypes of partridge pea and golden tickseed. By mid-November 2014, the seedlings had emerged at both sites, particularly among the non-FL ecotypes. However, in December, a series of hard frost events occurred and many of the emerged seedlings were killed back to the soil. During these freeze events, two of the 4 sites at the Citra, FL location seemed to have been more severely affected by the freeze than the other two. Therefore, in March 2015 at the Citra, FL site, a spring planting of the same seeds was established adjacent to the fall planting. Although this was not listed in the original proposal, the March planting was performed due to the site differences observed within the October planting. However, by late April 2015, little observable emergence has occurred among the spring planting.

In late April 2015, counts of emerged plants, per square meter, were taken at each location. The data are listed in Table 1. There were not statistical interactions by location, therefore data were pooled for comparison. It is observable from these data that no statistical differences were observed between the ecotypes for either species. The primary reason for this is that the sites were quite variable due to the influence of the freeze event mentioned above. Although all plots were planted the same day, with the same seed and equipment, large differences across a small geography were observed.

In March 2016, the plots at Ona and Citra were evaluated to assess growth of wildflowers and competiting plants. At this time we began to realize that few wildflowers had emerged. In Citra, we found 1 Florida coreopsis in one of the 4 plots (Table 1-1). No non-Florida golden tickseed, nor either biotype of partridge pea, was observed in any plot. In Ona, a total of 10 non-Florida partridge pea was observed across all 4 replications. No wildflowers were observed in any of the other Ona plots.

The reason for the lack of reestablishment in 2016 is not fully understood. However, the germination numbers do indicate why this may have occurred in the Citra location. Looking at partridge pea, the non-Florida ecotype flowered only briefly in 2015 and never produced seed pods – hence the 0% germination. Conversely, the Florida ecotype flowered heavily and produced many seed pods, but the seed did not appear to develop properly and fill the pods. Of the pods we sent to the seed lab for analysis, none of the seed were found to be viable. Viable seed were harvested from the golden tickseed, but plot to plot variability in seed germination was extremely high. The reason for this is unknown. One possible consideration is that April and

May 2015 were dry at the Citra and Ona locations (Table 1-2). Dry conditions during flowering can reduce both seed quantity and quality. This was followed by extremely wet conditions in June through September. These environmental extremes may have influenced the golden tickseed recruitment in 2016.

In March of 2017, all plots at Citra and Ona were evaluated for the presence of either flower species. Unfortunately, we did not observe a single flower in any plot at either location.

Conclusion

Florida nor non-Florida grown seed performed well in either location of this test. It appears that the low initial establishment rate was compounded by low or absent seed rain, followed by low germination of the seed that was produced. Due to both seed types performing poorly, it is difficult if not impossible to draw a conclusion whether the Florida or non-Florida seed should be preferentially used in the FDOT wildflower program.

Figure 1-1. A site with successful emergence of non-Florida golden tickseed. Photo Spring 2015.

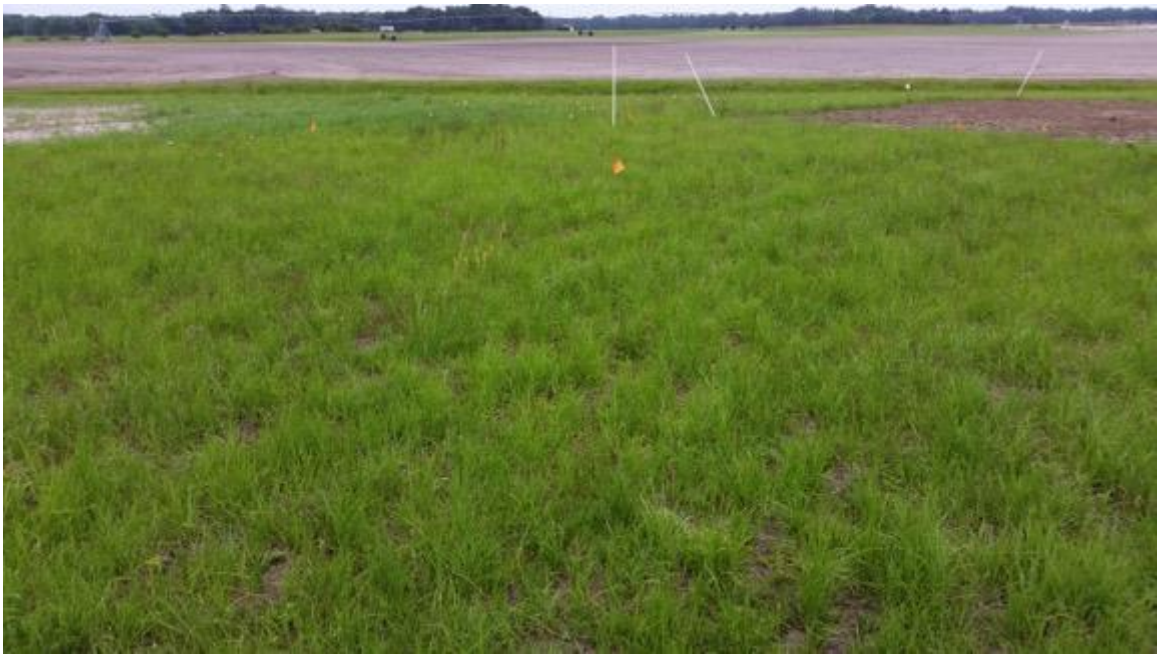

Figure 2-1. Another location where non-Florida golden tickseed didn't establish. Photo Spring 2015.

Figure 3-1. No recruitment of golden tickseed from the previous year seed rain. Spring 2016.

Figure 4-1 Figure 4. No recruitment at the Ona location from flowers present in 2015. Spring 2016.

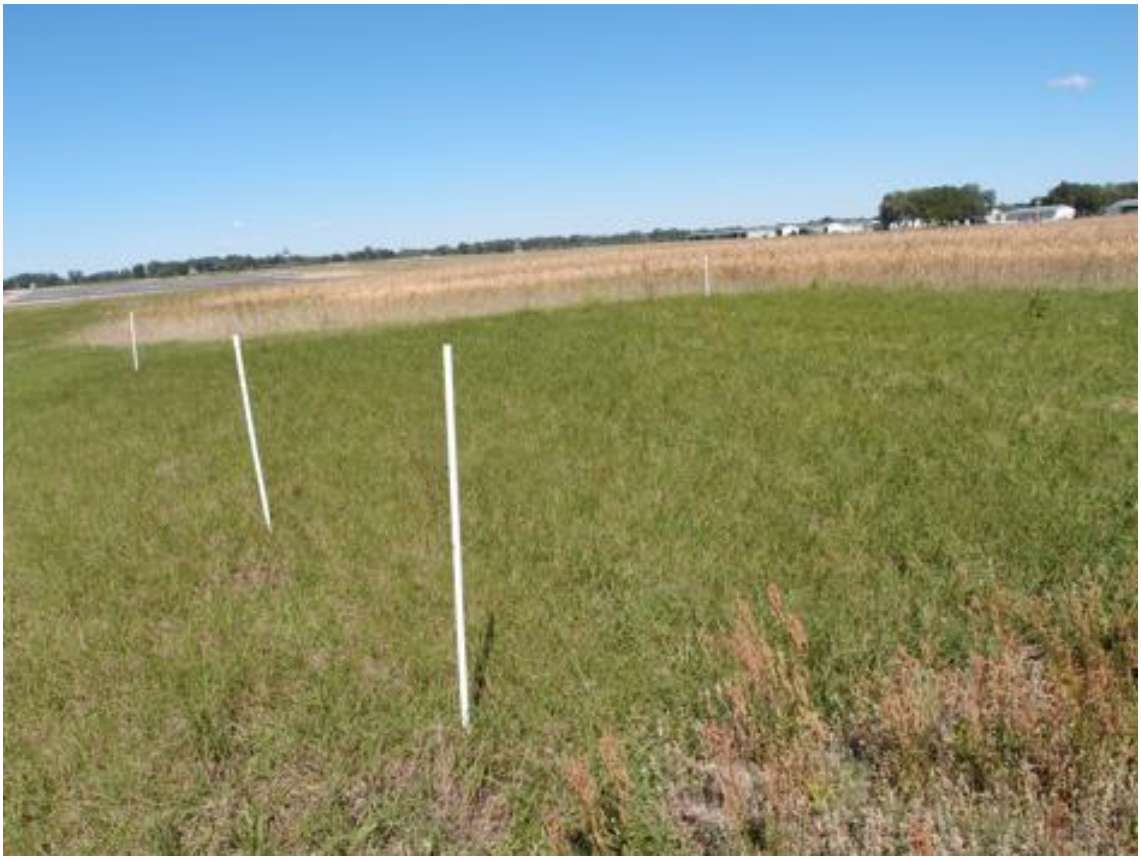

Figure 5-1. No wildflowers present in any plots at the Citra location. Spring 2017.

Figure 6-1. No wildflowers present in any plots at the Ona location. Spring 2016.

Species	Ecotype	Plants[a] m^{-2*} 4/27/15	% germination 6/21/15	% germination 8/28/15	Plants per plot 4/11/16		Plants per plot 4/3/17	
			Citra, FL	Ona, FL	Citra, FL	Ona, FL	Citra, FL	Ona, FL
Golden tickseed	Florida	5 a	38 a	24 a	0.25	0	0	0
	Non-FL	11.8 a	15 a	28 a	0	0	0	0
Partridge Pea	Florida	11.5 a	0	0	0	0	0	0
	Non-FL	5.5 a	0	0	0	2.5	0	0

Table 1-1. Plant density and germination of Florida and non-Florida ecotype wildflowers.

[a] Data were pooled across Gainesville and Ona

Month and year	Average Temp (F)	Humidity	Rainfall total (in)	Average Temp (F)	Humidity	Rainfall total (in)
	Citra, FL			Ona, FL		
Oct-14	69.72	78	1.21	72.83	76	0.82
Nov-14	57.98	78	4.35	62.94	81	4.18
Dec-14	59.16	84	2.11	62.88	85	0.25
Jan-15	55.44	81	5.52	61.18	83	1.6
Feb-15	54.69	74	2.2	58.95	79	3.43
Mar-15	68.06	79	1.57	70.29	80	1.1
Apr-15	73.64	81	2.61	74.67	81	3.84
May-15	76.31	74	2.18	76.03	75	1.69
Jun-15	80.48	78	3.46	78.78	82	8.99
Jul-15	80.38	86	11.4	79.09	86	8.06
Aug-15	80.52	86	10.19	79.61	87	14.96
Sep-15	78.18	88	4.5	79.43	87	4.48
Oct-15	72.15	83	0.48	75.02	83	1.68
Nov-15	70.3	84	1.31	73.19	82	1.14
Dec-15	67.8	86	2.61	70.96	79	2.09
Jan-16	53.53	81	3.52	59.23	71	6.03
Feb-16	57.42	71	3.84	60.41	75	1.89
Mar-16	67.27	75	1.9	69.09	77	1.07
Apr-16	70.6	71	0.85	71.1	74	0.94
May-16	75.7	71	4.65	74.72	77	3.28
Jun-16	81.57	77	5.27	79.54	85	10.4
Jul-16	82.9	78	1.74	81.11	84	6.51
Aug-16	80.88	85	5.24	80.54	85	5.28
Sep-16	79.16	85	7.19	79.64	86	4.89
Oct-16	72.3	80	1.43	74.41	81	1.83
Nov-16	63.93	78	0.03	66.25	78	0.15
Dec-16	62.96	82	0.74	67.76	83	0.64
Jan-17	60.2	79	1.32	63.02	82	1.05
Feb-17	63.36	77	1.48	65.99	80	1.66
Mar-17	64.15	71	1.33	66.08	73	1.36
Apr-17	71.63	68	3.8	72.28	71	0.06
May-17	76.79	70	3.2	76.79	73	1.73
Jun-17	78.5	87	12.69	78.28	89	12.65
Jul-17	80.74	85	6.58	80.16	87	5.66
Aug-17	81.22	87	7.74	80.74	87	8.35

Table 1-2. Monthly average weather data from the experimental sites in Citra and Ona, FL.

References

None