August 8, 2001

PROJECT REPORT

Reproductive Potential of the Endangered Species *Stylisma pickeringii*

Henry R. Owen and Janice M. Coons

INDR Small Project FY01 (7/00 - 6/01)

Introduction

As stated in our Small Project Proposal, the objectives of this project were:

1. To survey two areas (disturbed vs. undisturbed) of an existing population and to characterize population sizes and densities as well as flower and seed production.

2. To collect seed to obtain a third year of information about how seed color affects germination and to compare germination of new and old seed.

3. To further examine the influence of plant hormones/growth regulator treatments and the effect of photoperiod on root and/or shoot development of seedlings grown in sterile culture (*in vitro*) and/or in the greenhouse.

Methods

Four visits were made to the two areas near Snicarte, Illinois - a more recently disturbed area adjacent to a farmer's field (*i.e.* "Kramer's field") and a relatively undisturbed field near a gravel pit ("Davidsmeyer's field").

June 2nd, 2000: Fifty-meter transects were made at each area and data was collected for percent cover, number of flowers, and number of seedlings. This procedure was conducted at one meter intervals along the transect lines using a random-number table to select the number of paces alternating on each side of the transect lines. Ten seedlings were carefully removed from the sand and measured for seedling components.

July 7th, 2000: Data for percent cover, number of flowers, and number of seedlings was repeated. GPS readings were taken around the estimated perimeters of each area and plotted on a site map. Three hundred flowers at anthesis were tagged in each area in 5 x 5m areas. Fruit were collected later. Collected flies visiting *S. pickeringii* for later identification.

July 17th, 2000: Visited the one *S. pickeringii* plant/clump recorded in Cass County. Collected insects to compare with insects found at Snicarte sites.

July 28th, 2000:	Data for percent cover, number of flowers, and number of seedlings was repeated. Three hundred flowers at anthesis were tagged in each area in 5 x 5m areas. Fruit were collected later. Some fruit from an earlier tagging date were collected.
August 25th, 2000:	Data for percent cover, number of flowers, and number of seedlings was repeated. Collected remaining tagged fruit. Collected bulk fruit for germination tests.

Results

Two abstracts (one presented at the 93rd Annual Meeting of the Illinois State Academy of Science, held at Western Illinois University on April 20-21, 2001, and the second to be presented at the Annual Meeting of the Botanical Society of America in Albuquerque, NM on August 12-16, 2001) are included. In addition, a photocopy of the slides to be used during the BSA Annual Meeting is included that details and summarizes the results more thoroughly is included. A manuscript comparing the effect of photoperiod on lateral shoot growth and root growth of *S. pickeringii* currently is in draft form only. Initial data are included. Results indicate that long photoperiods promote lateral shoot production of this endangered species. Attempts to propagate *S. pickeringii* in a greenhouse environment will be continued at UIUC this Fall.

TRANSMITTAL FORM FOR PAPERS
93RD ANNUAL MEETING, ILLINOIS STATE ACADEMY OF SCIENCE

APRIL 20 – 21, 2001

PLEASE ANSWER ALL QUESTIONS:

1. Preferred Division: BOTANY

2. Method of Presentation: Podium XX Poster Session _____

3. Equipment needed: 2x2 Kodak slide projector XX Overhead projector _____
   NOTE: Other needed equipment must be furnished by the author(s) or arrangements made individually with the Division chair.

4. Time requested for presentation: 15 minutes. *NOTE:* Division Chairs usually limit time to 10-15 minutes, including questions.

Signature of one Academy member (regular or student) presenting the paper:

Signature: Brent L. Todd Date: 5 February 2001

Address 2020 10th Street, #201 Phone No.: (217) 348-3032

Charleston, IL 61920

-or- 17 Paris Street

Ridge Farm, IL 61870-0142

*Is this paper in competition for a student award in the Botany, Cell, Molecular & Developmental Biology, Earth Science, Environmental Science, Health Science, Microbiology or Zoology Division?
Circle Division

ABSTRACT

Type your abstract within the box below, following directions found on the other side of this announcement. Additional copies may be obtained from Ms. Pat Zimmerman, (217) 782-6436. A FEE OF $15.00 WILL BE CHARGED TO THE AUTHOR IF FAILURE TO FOLLOW DIRECTIONS FOR TYPING THE ABSTRACT REQUIRES THAT IT BE RETYPED.

Send to Ms. Pat Zimmerman, ISAS, Illinois State Museum, Springfield, IL 62706, who must receive it no later than 5 February, 2001.

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REPRODUCTIVE POTENTIAL OF *STYLISMA PICKERINGII* (PATTERSON BINDWEED), AN ENDANGERED PLANT OF ILLINOIS SAND PRAIRIES, IN DISTURBED AND UNDISTURBED AREAS.

B.L. Todd, H.R. Owen, Eastern Illinois University, Charleston, IL 61920, and J.M. Coons, University of Illinois, Urbana, IL 61801.

Presently, *Stylisma pickeringii* (Torr.) Gray (Patterson bindweed) occurs near Snicarte (Mason Co.), Illinois in two areas that were treated differently (i.e. a field with major disturbance from discing and chemical treatments, and an area with minimal disturbance). Information about how disturbance affects the status of these populations would be valuable for management and reintroduction efforts. This study was conducted to compare growth and reproductive potential of *S. pickeringii* in the two disturbance areas. Percent cover, flower numbers, and seedling numbers were measured during summers 1999 and 2000 from the two populations. In 1999, percent cover between the disturbed and undisturbed areas were similar (40.7 and 43.8%, respectively) while in 2000 the percent cover of the disturbed area (44.8%) was higher than that of the undisturbed area (16.4%). The disturbed area had similar percent cover between 1999 and 2000 (40.7 and 44.8%, respectively) while the undisturbed area showed a decrease in percent cover from 1999 to 2000 (43.8 and 16.36%, respectively). The disturbed site produced more flowers during both 1999 and 2000; however, both populations produced more flowers in 2000 than in 1999. In 2000, more seedlings were being produced in the disturbed area than in the undisturbed area. Early July was when most seedlings were observed. Thus, ground disturbance affected the cover, flower production, and seedling

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[1]Department of Biological Sciences, Eastern Illinois University, Charleston, IL 61920; [2]Department of Natural Resources and Environmental Sciences, University of Illinois, Urbana, IL 61801. - Seed germination and seedling development of *Stylisma pickeringii* (Patterson bindweed), an Illinois-endangered sand prairie species.

Management and reintroduction efforts of *Stylisma pickeringii* (Torr.) Gray (Patterson bindweed) are limited by a lack of knowledge about its reproductive biology, including information about its seed germination and seedling development. The purpose of this study was to investigate its requirements for seed germination and its seedling development. To investigate seed requirements, seeds were harvested from Mason County over three growing seasons (1998, 1999 and 2000). For all three years, seeds of different colors (yellow, tan, maroon) were counted and germinated in petri dishes at 25 C with or without scarification. In 1999 and 2000, flowers were tagged and seeds were collected to determine how seed age and harvest date affect seed color. To investigate seedling development, seedlings were counted in the field and component parts (shoot, root, and underground shoot branching) were measured. Seed germination was different depending on seed color with yellow being the highest (55-96%) and maroon being the lowest (0%). Also, the seed coat inhibited germination as scarification increased germination. Effects of seed age and harvest date on seed color were inconclusive. The highest seedling density recorded was 1.8 plants/m^2. For seedling development, *S. pickeringii* develops an extensive taproot before developing its shoots. Its shoot branches originate 7.2 cm beneath the soil surface. This research has provided knowledge about the seed and seedling biology of *S. pickeringii*, which will be useful in the management of this species.

Key words: Convolvulaceae, endangered plant, germination, *Stylisma pickeringii*

Seed germination and seedling development of *Stylisma pickeringii* (Patterson bindweed), an Illinois-endangered sand prairie species.

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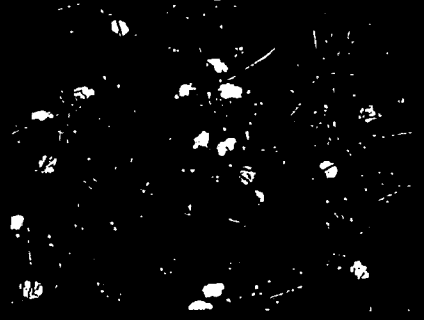
Eastern Illinois University, Charleston

Janice M. Coons
University of Illinois, Urbana-Champaign

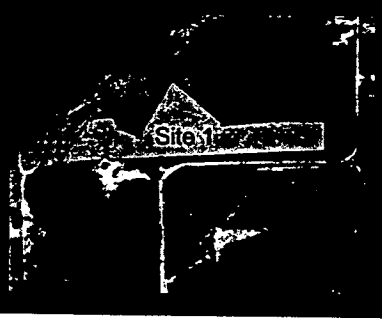
Stylisma pickeringii (Torr.) A.

S. pickeringii in flower



Sand Deposits and Counties of Illinois

S. pickeringii Areas of Mason County, Illinois



Rationale

Management and reintroduction efforts are limited by a lack of knowledge about the reproductive biology of *S. pickeringii*.

Objectives

Investigate requirements of *S. pickeringii* for seed germination and seedling development.

Seeds

- Germination
  - Harvest years
    - 1998, 1999, 2000
  - Seed color
    - yellow, tan, maroon
  - Scarification vs. no scarification

- Seed Color
  - Seed age
  - Harvest date

Seed Color of *S. pickeringii*

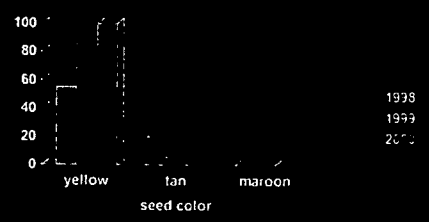
yellow tan maroon

Seedling Development

- Seedlings
  - Emergence
  - Morphology

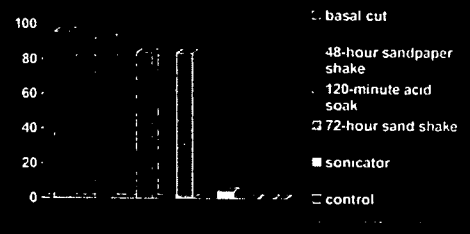
Results

Percent germination of three colors of scarified *S. pickeringii* seeds harvested in 1998, 1999, and 2000

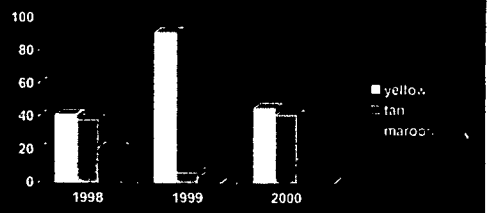


*Unscarified seeds had no germination.

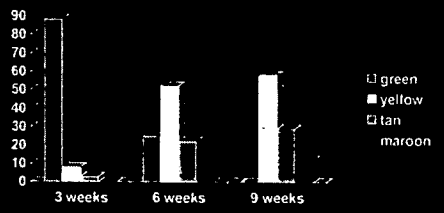
Effects of five scarification techniques on percent germination of *S. pickeringii*



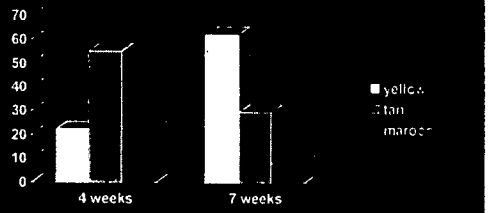
Percent of three colors of *S. pickeringii* seeds harvested in 1998, 1999, or 2000



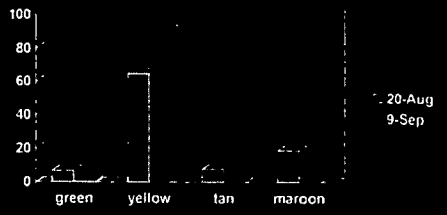
Percent color of *S. pickeringii* seeds 3, 6, or 9 weeks after flowering in 1999



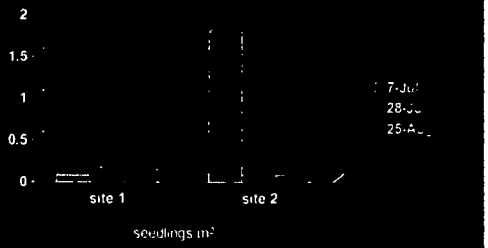
Percent color of *S. pickeringii* seeds 4 or 7 weeks after flowering in 2000

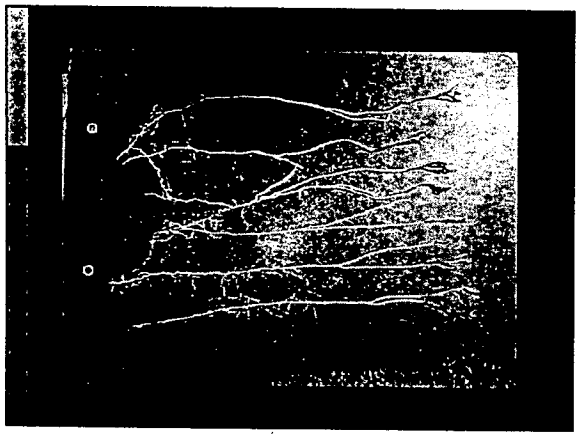


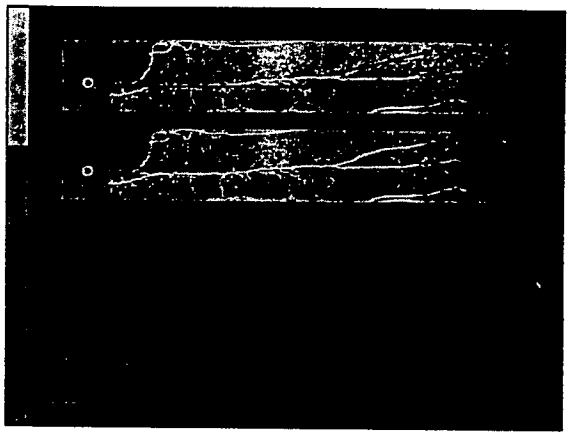
Seed color percentages on different harvest dates, 1999



Seedling density (plants/m²) over summer 2000







Conclusions

- Yellow seed germination is significantly higher than that of tan and maroon seeds.

- Seed coat inhibits germination, as scarification increases germination.

- More yellow seeds develop than tan or maroon.

- Effects of seed age and harvest date on seed color were inconclusive.

- The highest seedling density recorded was 1.8 plants/m^2.

- *S. pickeringii* develops an extensive taproot before developing its shoots.
- Its shoot branches originate 7.2cm below the soil surface.

This research has provided knowledge about the seed and seedling biology of *S. pickeringii*, which will be useful in the management of this species.

Acknowledgements

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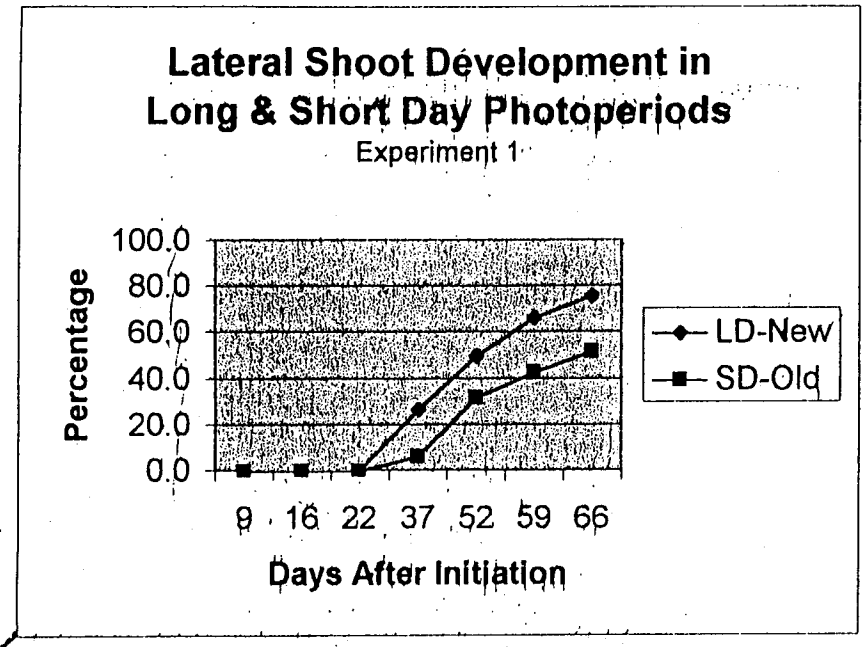
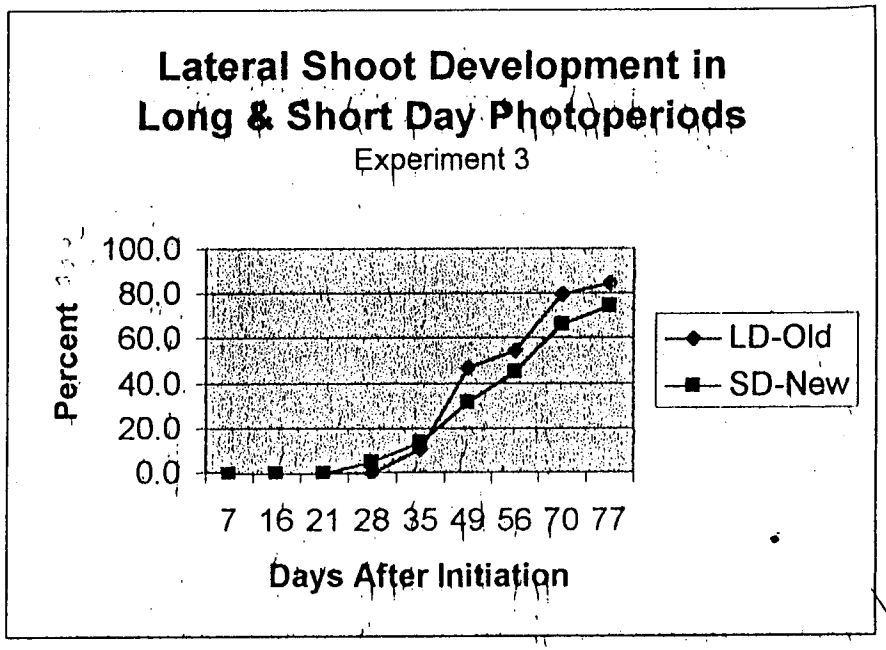
- EIU Honors Program
- EIU Council on Faculty Research
- EIU Department of Biological Sciences
- Jim Davidsmeyer, Landowner
- Ed Kramer, Landowner
- Bill McClain, IDNR

Bombyliidae

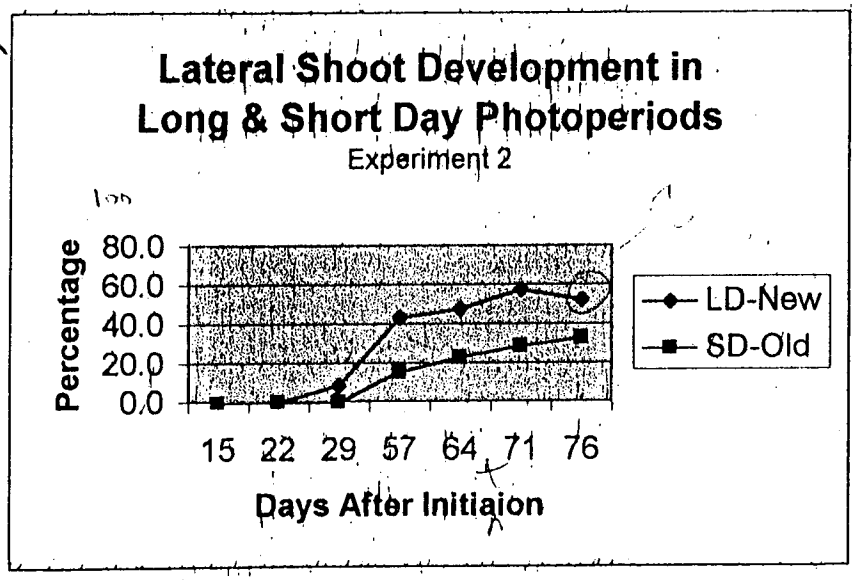
Henry

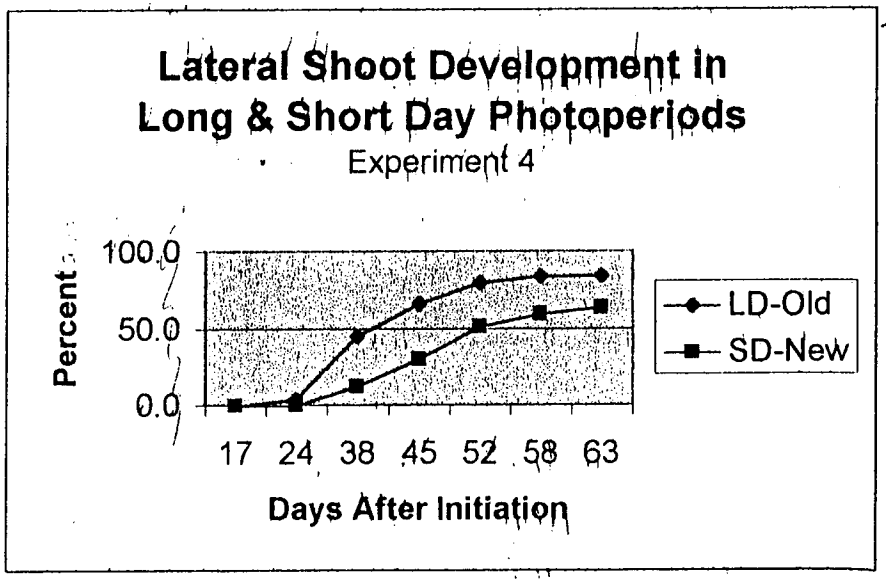
Same chamber





Same Chamber



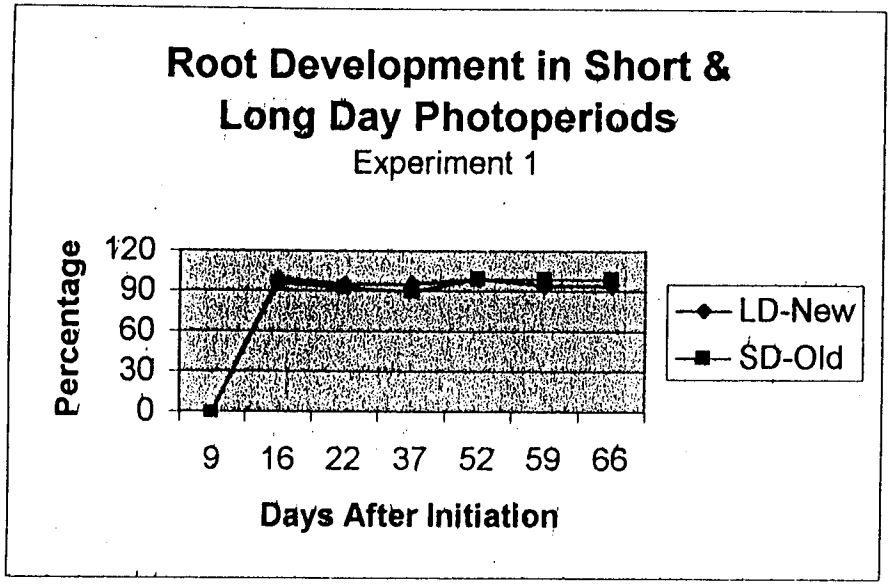


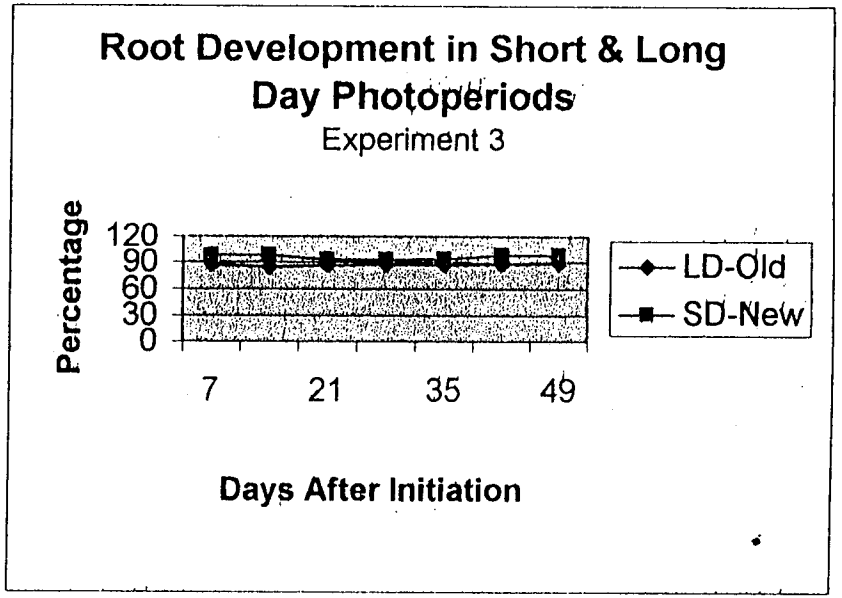
- switched chamber photoperiod between Exp #2 & Exp 3.

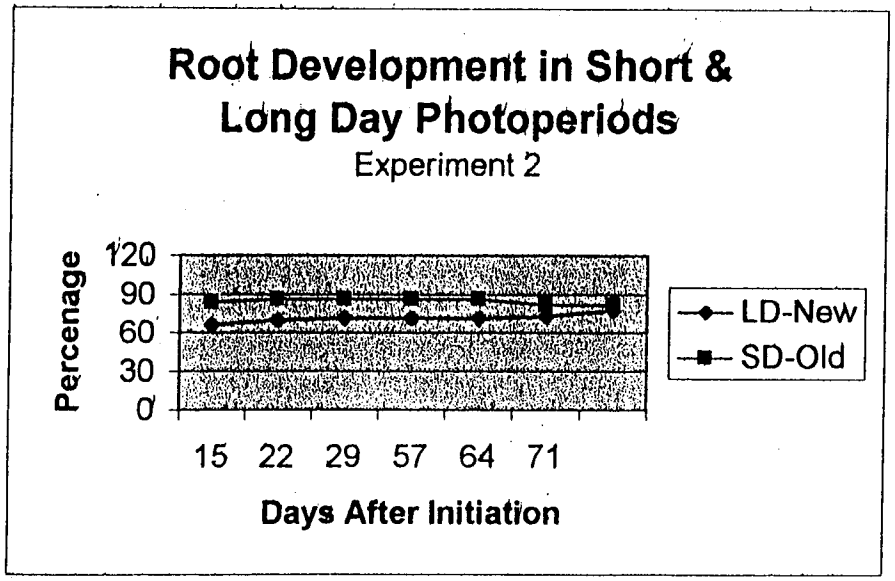
Lateral shoot length (cm)

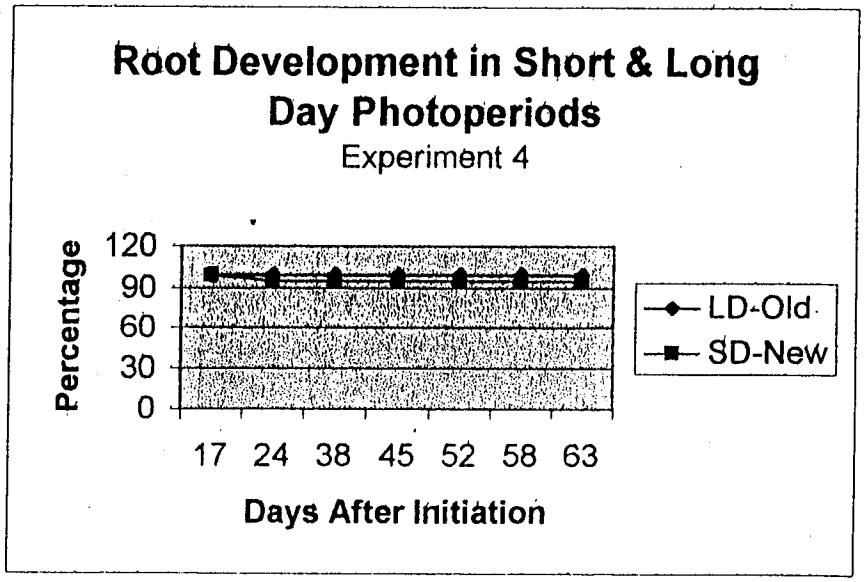
SD - old
LD - new

	1	2	3	4	5	6	7
		ex1d9W			ex1d9WO		
		w/out zeroes			w/ zeroes		
	Exp. 1	LD	SD	SIGNIFICANT	LD	SD	SIGNIFICANT
ex1d9W	Day						
1	9	0	0	—	0	0	
2	16	0	0	—	0	0	
3	22	0	0	—	0	0	
4	37	0.93 ± 0.87	0.45 ± 0.20	No	0.26 ± 0.55	0.03 ± 0.15	Yes
5	52	3.47 ± 2.65	1.74 ± 2.23	No	1.74 ± 2.25	0.56 ± 1.59	Yes
6	59	5.81 ± 4.02	3.29 ± 2.21	Yes	3.88 ± 3.69	1.41 ± 2.26	Yes
7	66	6.68 ± 4.42	4.39 ± 3.14	No	4.03 ± 4.68	2.44 ± 3.26	No
8							
9	Exp. 2						
10	15	0	0	—	0	0	—
11	22	0	0	—	0	0	—
12	29	0.35 ± 0.07	0 ± 0	Yes	0.03 ± 0.1	0 ± 0	No
13	57	3.93 ± 1.96	4 ± 0.24	No	1.71 ± 2.21	0.62 ± 1.48	Yes
14	64	4.84 ± 2.32	3.47 ± 1.92	No	2.31 ± 2.74	0.80 ± 1.92	Yes
15	71	5.36 ± 2.31	3.59 ± 2.33	No	2.57 ± 2.96	0.97 ± 2.19	Yes
16	76	6.68 ± 2.55	4.09 ± 2.89	Yes	3.20 ± 3.59	1.26 ± 2.65	Yes
17	Exp. 3						
19	7	0	0	—	0	0	—
20	16	0	0	—	0	0	—
21	21	0	0	—	0	0	—
22	28	0	0	—	0 ± 0	0.003 ± 0.02	No
23	35	0.25 ± 0.05	0.67 ± 0.74	No	0.02 ± 0.06	0.06 ± 0.28	No
24	49	1.09 ± 1.04	2.04 ± 1.72	No	0.32 ± 0.74	0.54 ± 1.27	No
25	56	2.27 ± 1.47	2.56 ± 1.70	No	0.88 ± 1.43	1.10 ± 1.93	No
26	70	5.34 ± 3.12	5.38 ± 3.25	No	2.76 ± 3.50	2.87 ± 3.53	No
27	77	6.68 ± 3.36	6.51 ± 3.56	No	3.66 ± 4.22	3.90 ± 4.17	No
28							
29	Exp. 4						
30	17	0	0	—	0	0	—
31	24	0	0	—	0.03 ± 0.18	0 ± 0	No
32	38	1.42 ± 1.82	0.70 ± 0.31	No	0.50 ± 1.23	0.07 ± 0.27	No
33	45	1.91 ± 2.18	1.20 ± 1.01	No	0.99 ± 1.79	0.26 ± 0.87	Yes
34	52	2.89 ± 2.57	1.46 ± 1.51	Yes	1.93 ± 2.42	0.70 ± 1.57	Yes
35	58	4.30 ± 2.86	2.96 ± 2.41	No	2.91 ± 3.05	1.39 ± 2.45	Yes
36	63	5.84 ± 3.11	4.38 ± 2.88	No	4.15 ± 3.68	2.33 ± 3.25	Yes
37							
38							
39							
40							


Root Development in Short & Long Day Photoperiods
Experiment 1
Percentage
120
90
60
30
0
9
16
22
37
52
59
66
Days After Initiation
LD-New
SD-Old


Root Development in Short & Long Day Photoperiods
Experiment 3
Percentage
120
90
60
30
0
7
21
35
49
Days After Initiation
LD-Old
SD-New


Root Development in Short & Long Day Photoperiods
Experiment 2
Percenage
120
90
60
30
0
15
22
29
57
64
71
Days After Initiation
LD-New
SD-Old


Root Development in Short & Long Day Photoperiods
Experiment 4
Percentage
120
90
60
30
0
17
24
38
45
52
58
63
Days After Initiation
LD-Old
SD-New

3 colors - Stylisma pickeringii

Stylisma flowers and buds

Stylisma seedlings

Todd, Gillespie (transects)

Undisturbed site (Davidsmeyer) - 2

Undisturbed site (Davidsmeyer)

Volunteer

Wetland Trail

Wetland

Wood Duck Sign

Arrowhead sign

Bee visiting Stylisma pickeringii

Bombyliidae visitying Stylisma pickeringii

Cass County Stylisma population

Disturbed site (Kramer)

Henderson County population

Insect collection plot

McClain, Nohren, Owen, Eric, Coons