**Increasing Varietal Suitability and Availability of Cowpea and**

**Forage Radish Cover Crop Seed for Northern Climates**

**Annual Report for 2014**

**Research and Education Grant Project LNC12-347**

**Total Budget: $199,776**

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**Summary**

 We carried out a second year of evaluations with a smaller set of cowpea lines. There were crop failures at two sites, but we continued to learn a great deal about this crop. Wet, cold weather also made our work with radish very difficult, but our second season of mating did return us enough seeds for continued seed increase. Outreach via project updates and other reports from NPSAS continued. The project was also featured during two field days and we posted a video highlighting our work with cowpea that requested input from the public to assist with selections.

**Objectives/Performance Targets**

**Objective 1.** Increase access to cowpea seed varieties with useful cover crop traits and the ability to mature quality seed in northern climates.

Activity A1. Screen 8-12 cowpea varieties in spring seed production and late summer cover crop evaluations.

Activity A2. Conduct winter nursery seed increases of top ranked cowpea varieties, 8-12 in 2013-2014 and 2-4 in 2014-2015.

**Objective 2.** Increase access to forage radish seed with useful cover crop traits and the ability to mature quality seed in northern climates.

Activity A1. Plant roots of a pre-selected forage radish bulk population in a root-to-seed production plot. Harvest seeds by mid-summer.

Activity A2. Plant harvested seeds to cover crop trials in mid-summer; dig, evaluate, select, and overwinter roots for another round of selection.

**Accomplishments/Milestones**

**Cowpea:** Seeds of twelve varieties (ten USDA NPGS accessions and two commercially available varieties) were sent to Puerto Rico in early January 2014 for increase by the University of Puerto Rico. The increase was very successful, with up to 60 pounds returned for several of the varieties. Seed was germination tested and seed counts were determined before shipping seeds and OMRI approved inoculant to each location. Storage of the seeds, however, hit a big difficulty by mid summer as hundreds of cowpea weevils (*Callosobruchus maculatus*) began emerging and overrunning our storage space. Seed was bagged in an extra garbage bag and frozen for a week in order to kill these pests. That and freezing over the winter seems to have ended the infestation in the extra seeds that remained in storage.

 Seed evaluation plots were again planted late due to the extended rain and cold in the spring of 2014. However, rain prevented weed control at the South Dakota site and those plots were terminated. Cold continued throughout the summer and only one variety matured seeds in Dickinson, ND. Plants were stressed at the Carrington, ND and Arlington, WI sites but full maturity was achieved at these locations. Late planted cowpeas failed in North Dakota and were not attempted in South Dakota, so only Wisconsin was able to get cover crop data for this planting period in 2014.

Field days were not held at each location due to the late planting backing up many activities at the agricultural experiment stations until late in the summer. NPSAS and NDSU Carrington Research Extension Center held another joint organic ag field day in July, 2014 and the cowpea planting was featured during this event which had over 60 people in attendance. A follow up field event in Carrington to evaluate the cowpeas in early September had four attendees. The project was also highlighted at this time by the University of Wisconsin at Madison during the Organic Field Day at the Arlington, WI research site.

### Other outreach for the project has included ongoing posts to the NPSAS Farm Breeding Club Facebook page and photos and notes about the project in the NPSAS Germinator Newsletter. A video showing the plots in Carrington, ND was posted to YouTube ([Participatory Evaluation of Cowpea Varieties for Northern Regions](https://www.youtube.com/watch?v=H6PB6xU_x4g)) in order to gather additional input from farmers before picking the varieties to be grown in 2015.

 Key data were analyzed from both seasons in December 2014, and a table of the average results shared with stakeholders in the region so that they could prioritize the most interesting accessions. Six stakeholders shared their ratings of the cowpeas and chose their top five varieties. Analysis of this voting provided a list of six of the accessions for further increase and evaluation in 2015. Some of the data that were shared for this assessment are in the table below.

|  |
| --- |
| **2013-2014 Cowpea Evaluations (North and South Dakota, Wisconsin)** |
| **Variety** | **Days to Emerge** | **Vigor** | **Canopy Ht** | **Days to 80% Maturity** | **Yield** | **Seed/LB** | **Biomass** |
| **221731** | **12.0** | **3.0** | **42.7** | **90** | **700** | **4290** | **869** |
| **292904** | **10.1** | **3.1** | **38.2** | **88.7** | **761** | **4807** | **657** |
| ***293499*** | **10.2** | **3.8** | **36.3** | **88.5** | **1027** | **5487** | **872** |
| ***293525*** | **10.7** | **3.1** | **36.0** | **87.7** | **997** | **3763** | **790** |
| ***293570*** | **9.0** | **4.5** | **45.4** | **89.0** | **949** | **4066** | **606** |
| **339623** | **11.7** | **3.1** | **38.4** | **85.2** | **740** | **6676** | **842** |
| ***352903*** | **9.9** | **2.2** | **40.0** | **88.0** | **1062** | **7465** | **862** |
| **367860** | **9.3** | **2.2** | **35.7** | **88.0** | **759** | **10103** | **777** |
| ***491446*** | **10.3** | **3.2** | **41.0** | **88.2** | **1008** | **4758** | **691** |
| ***491468*** | **10.4** | **3.3** | **33.8** | **86.0** | **772** | **6279** | **655** |
| **Palapye** | **8.8** | **3.0** | **39.1** | **89.7** | **839** | **5863** | **705** |
|  |  |  |  |  |  |  |  |
| **Means** | **10.2** | **3.2** | **38.8** | **88.1** | **874** | **5778** | **757** |

**Radish:** Kat Becker grew out a large seed increase plot of radish in 2014 from the seeds of these accessions that were intermated in 2013. This summer was similarly cold and damp, which resulted in very low increase of seed, with only two pounds of clean seed for planting in 2015. However, this additional generation should have resulted in further genetic recombination and this should allow for the eventual selection of new genotypes.

|  |  |  |
| --- | --- | --- |
| **Accession** | **Name** | **Origin** |
| 217961 |  | Pakistan |
| 263262 | Minowase | Japan |
| 263263 | Miyashige | Japan |
| 268370 | Mul-ey | Afghanistan |
| 269589 |  | Pakistan |
| 271517 |  | India |
| 286432 |  | Nepal |
| 391632 | Chuan Xin Hong | China |

Outreach for the radish objective included postings on the FBC Facebook page and notes in the NPSAS Germinator. No field events were held in 2014 given our complete revision of the project activities with this species. The radish part of the project has been the most challenging, but now that we have some new and hopefully superior seeds. We anticipate planning field days to discuss and demonstrate radishes, radish breeding, and radish seed production.

**Impact and Contributions/Outcomes**

* Seeds of 10 cowpea accessions and two commercial checks were increased for ongoing evaluations at four sites in the upper Midwest in the cold, wet summer of 2014. Useful data was collected even though some sites failed.
* Remnant seeds of 6 of these accessions were sent for further increase in Puerto Rico for 2015 replicated variety trials.
* Over 60 attendees at the organic field day in Carrington, ND in July 2014 heard about the cover crop project and were able to see the early growth in the cowpea trial. Four attendees helped to evaluate the cowpeas at Carrington in September 2014. A video of the cowpea plots during this field event was posted to YouTube to allow others to help evaluate the cowpeas ([Participatory Evaluation of Cowpea Varieties for Northern Regions](https://www.youtube.com/watch?v=H6PB6xU_x4g)). It has had over 130 views by September 2015.
* NPSAS members and other interested stakeholders in the region were able to see our cowpea results and rate the varieties for their value in further evaluations. Six stakeholders from within and outside the project offered ratings of the varieties, including farmers into the selection of possible cover crop varieties best adapted to the region. Sharing of project results attracted the attention of other researchers from North Dakota and Minnesota who would join the project in 2015.
* Updates about the cover crop project were shared via the NPSAS Germinator newsletter and the NPSAS Farm Breeding Club Facebook page. The Germinator gets to all 400 plus members of NPSAS and the FBC Facebook page that has 816 likes as of September 2015. The impact of this is increased awareness of cover crops and these species.