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Annual Report - 2016

Breeding and Evaluation of Kentucky Bluegrasses, Tall Fescues, Fine Fescues Perennial Ryegrasses and Bentgrasses for Turf

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Objectives:

1. Collect and evaluate useful turfgrass germplasm and associated endophytes.

2. Continue population improvement programs to develop improved cool-season cultivars and breeding synthetics.

3. Develop and utilize advanced technology to make current breeding programs more effective and efficient.

Start Date: 1982

Project Duration: Continuous

Total Funding: $10,000 per year

As of October 30, 2016 over 1,682, promising turfgrasses and associated endophytes were collected in Italy ,Greece, Romania and Mallorca These are having seed produced in the Netherlands and will be evaluated in New Jersey starting in fall 2016. Over 9,855 new turf evaluation plots, 136,681 spaced-plant nurseries and 9276 mowed single-clone selections were established in 2015.

Over 200,000 seedlings from intra and inter-specific crosses of Kentucky bluegrass were screened for promising hybrids under winter greenhouse conditions and the superior plants were put into spaced-plant nurseries in the spring. Over 38,770 tall fescues, 8,000 Chewings fescues, 4,000 hard fescues, 27,000 perennial ryegrasses and 8,000 bentgrasses were also screened during the winter in greenhouses and superior plants were put in spaced-plant nurseries. Over 95 new inter- and intra-specific Kentucky bluegrasses were harvested in 2016.

The following crossing blocks were moved in the spring of 2016: 7 hard fescues (253 plants), 2 Chewings fescues (61 plants), 7 perennial ryegrasses (243 plants), 6strong creeping red fescues(134 plants), 10 tall fescues (313 plants), 7 creeping bentgrasses (96 plants) ,5 velvet bentgrasses (82 plants) and 9 colonial bentgrasses (181 plants).

To enhance our breeding for resistance to gray leaf spot, a August 25 planting of 2400 perennial ryegrasses were seeded. Excellent *Pythium* blight control was attained and

a good gray leaf spot epidemic occurred. This data will be used to select future varieties of perennial ryegrass. Over 27,000 perennial ryegrasses were planted in the spring of 2016 as spaced-plants. They were allowed to develop seed heads in the late spring and selections were made for stem and crown rust resistance and heat tolerance.

The breeding program continues to make progress breeding for disease resistance and improved turf performance. New Promising varieties named and released in 2016 were Intense,Spark and Ruckus perennial ryegrasses, new tall fescues GTO, Amity, SuperSonic, Maestro, Avenger II ,Titanium SLS,
Selkirk, Firecracker SLS, and Raptor III. There was also one creeping red fescue fescue named Xeric and two hard fescues Jetty and Gladiator. New Kentucky blugrasses Zinger and Mazama. There was one new creeping bentgrasses named Piranha and three new colonial bentgrasses Puritan, Musket, and Heritage. .

Summary Points

- Continued progress was made in obtaining new sources of turfgrass germplasm. These sources are being used to enhance the Rutgers breeding program.

- Modified population backcrossing and continued cycles of phenotypic and genotypic selection combined with increasing sources of genetic diversity in turfgrass germplasm. This has resulted in the continued development and release of top performing varieties in the NTEP

- Two perennial ryegrasses, 9 new tall fescues, 2 Kentucky bluegrasses and 3 fine fescue, and 1 creeping bentgrass and three new colonial bentgrasses were released in 2016.

- Published or have in press over 4 referred journal articles in 2016

- 27 Plant variety certificates issued and 20 PVP's applied for

References

Refereed Research Publications:

Honig, J.A., E. Zelzion, N. E. Wagner, C. Kubik, V. Averello, J. Vaiciunas, D. Bhattacharya, S.A. Bonos, and W. A. Meyer. 2017. Microsatellite (SSR) identification in perennial ryegrass (Lolium perenne L.) using next generation sequencing. Accepted to Crop Science August 21, 2016.

Koch, E. D. J. Honig, J. Vaiciunas, and S. A. Bonos. 2017. Endophyte effect on salinity tolerance in perennial ryegrass. Tentatively Accepted to International Turfgrass Society Research Journal August 21, 2016.

Yue, C., J. Wang, E. Watkins, S.A. Bonos, K.C. Nelson, J.A. Murphy, W.A. Meyer, and B.P. Horgan. 2016. Heterogeneous U.S. and Canada consumer preference for turfgrass attributes. Submitted to Canadian Journal of Agricultural Economics, Nov. 25, 2015. Tentatively accepted for publication July 8, 2016.

Jespersen, D., E. Merewitz, Y. Xu, J. Honig, S. Bonos, W. Meyer, B. Huang. 2016. Quantitative trait loci associated with physiological traits for heat tolerance in creeping bentgrass. Crop Science Vol. 56 No. 3, p. 1314-1329.

Abstracts:

William A. Meyer and Stacy A. Bonos. 2016. Major advances from the Rutgers turfgrass breeding program. p. 18. In Proceedings of the 25th Rutgers Turfgrass Symposium. March 18, 2016.

David Jespersen, Stacy A. Bonos, Faith C. Belanger, Paul Raymer and Bingru Huang. 2016. Characterization and validation of molecular markers linked to heat and drought tolerance for marker-assisted selection of stress tolerant creeping bentgrass. p.22. In Proceedings of the 25th Rutgers Turfgrass Symposium. March 18, 2016.

Vincenzo Averello, Christine Kubik, Jennifer Vaiciunas, Stacy A. Bonos, William A. Meyer and Josh Honig. 2016. Classification of tall fescue (*Festuca arundinacea* Schreb.) cultivars and collections using chloroplast microsatellite (cpSSR) markers. p.45. In Proceedings of the 25th Rutgers Turfgrass Symposium. March 18, 2016.

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Austin L. Grimshaw, Trent M. Tate, William A. Meyer, Eric Watkins and Stacy Bonos. 2016. Evaluation of hard fescue (Festuca brevipila Tracy) for summer patch (Magnaporthiopsis poae J. Luo & N. Zhang) resistance. p. 54. In Proceedings of the 25th Rutgers Turfgrass Symposium. March 18, 2016.

Trent M. Tate, William A. Meyer, Stacy A. Bonos, Patrick E. McCullough. 2016. Evaluation of nine tenacity selected fine fescues: Quantifying the tolerance levels and determination of the absorption and translocation. p. 71. In Proceedings of the 25th Rutgers Turfgrass Symposium. March 18, 2016.

Averello, V. C. Kubik, J. Vaiciunas, W. Meyer, S. Bonos and J. Honig. 2016. Genetic diversity of tall fescue (Lolium arundinaceum (Schreb.) Darbysh.) cultivars and collections using chloroplast microsatellite (cpSSR) markers. Plant Animal and Genome Conference. San Diego, CA. January 8, 2016.

Eric Watkins, Stacy A. Bonos, Chengyan Yue, Kristen Nelson, Brian Horgan, Paul Koch, James A. Murphy, Bingru Huang, William A. Meyer and Bruce B. Clarke. 2015. Germplasm improvement of low-input fine fescues in response to consumer attitudes and behaviors. In Agronomy Abstracts, Madison, WI.

Stacy A. Bonos, Jennifer Vaiciunas, Udi Zelzion, Debashish Bhattacharya, William A. Meyer, Eric Koch and Joshua Honig. 2015. Transcriptome analysis of salt-stressed perennial ryegrass. In Agronomy Abstracts, Madison, WI.

David Jespersen, Joshua Honig, Stacy A Bonos, William A. Meyer and Bingru Huang. 2015. Quantitative trait loci associated with delayed heat-induced senescence in creeping bentgrass. In Agronomy Abstracts, Madison, WI.

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Vincenzo Averello, Christine Kubik, Jennifer Vaiciunas, William A. Meyer, Stacy A Bonos and Joshua Honig. 2015. Genetic diversity of tall fescue (Lolium arundinaceum (Screb.) Darbysh.) cultivars using microsatellite (SSR) markers. In Agronomy Abstracts, Madison, WI.

Non-referred Publications:

Weibel, E.N., T.J. Lawson, J.B. Clark, J.A. Murphy, B.B Clarke, W.A. Meyer and S.A. Bonos. 2016. Performance of bentgrass cultivars and selection in New Jersey turf trials. 2015 Rutgers Turfgrass Proceedings 47:1-40.

Tate, T.M., A.L. Grimshaw, D.A. Smith, R.F. Bara, M.M. Mohr, E.N. Weibel, S.A. Bonos and W.A. Meyer. 2016. Performance of fine fescue cultivars and selections in New Jersey turf trials. 2015 Rutgers Turfgrass Proceedings 47:41-58.

Grimshaw, A.L., T.M. Tate, M.M. Mohr, R.F. Bara, D.A. Smith, E.N. Weibel, J.A. Murphy, S.A. Bonos and W.A. Meyer. 2016. Performance of Kentucky bluegrass cultivars and selections in New Jersey turf trials. 2015 Rutgers Turfgrass Proceedings 47:59-124.

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Trent Tate, Ronald F. Bara, Dirk A. Smith, Melissa M. Mohr, Stacy A. Bonos, and William A. Meyer. 2016. Performance of Tall Fescue Cultivars and Selections in New Jersey Turf Trials. 2015 Rutgers Turfgrass Proceedings 47:149-176.