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Influence of FeNPs (Iron nanoparticles) treatment on biochemical parameters of *Stylosanthes seabrana* genotypes

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Abstract
The present experiment was conducted during 2022-23 at Institute of Agricultural Biotechnology and Green nanotechnology laboratory, UAS, Dharwad, Karnataka. This study involved evaluation of impact of 80 ppm FeNPs treatment on biochemical parameters of *Stylosanthes seabrana* genotypes seeds. The laboratory experiment comprised of seven different *S. seabrana* genotypes which were exposed to 80 ppm FeNPs treatment for 12 hours are evaluated for biochemical parameters compared to their respective controls in three replications with two factorial completely randomized design. The results revealed that, among the seven *S. seabrana* genotypes, *S. seabrana*-11595 and *S. seabrana*-104710 seeds treated with 80 ppm FeNPs exhibited significantly higher total dehydrogenase enzyme activity with values of 1.284 and 1.183, respectively and increased α-amylase activity of 1.210 micro mol/min/mg of protein and 1.130 micro mol/min/mg of protein compared to their respective control groups.

Keywords: FeNPs, *Stylosanthes*, genotypes, α amylase, total dehydrogenase

Introduction
India predominantly remains an agrarian nation, where approximately 70 percent of its population resides in rural areas. Agriculture in arid and semi-arid regions heavily relies on livestock, contributing around 25 percent to the overall agricultural income. Despite India boasting a substantial livestock population of over 535.78 million animals, coupled with poultry, it lags behind in global production of milk and other livestock products (Anon, 2021) [1].

Forage genetic resources are pivotal for ensuring food security and alleviating poverty, especially in developing countries. Regrettably, limited efforts have been made to enhance productivity and broaden the genetic diversity of forage crops in tropical, subtropical, mountainous, and arid environments. Only a small fraction of the genetic material of the primary forage genera is securely stored for the long term. It is imperative to identify, collect, and assess a wide array of germplasm with the consent and cooperation of traditional custodians, pastoralists, and farmers who have nurtured the diversity of their forage resources through their use and management.

Evaluating the genetic diversity of a germplasm collection is crucial for enabling genetic improvements and the optimal utilization of these resources. Such evaluation is also vital for monitoring the genetic stability of germplasm during storage. Assessing germplasm can be based on molecular, biochemical, and morphological characteristics (Cameron, 1983) [2]. Breeding programs can only commence after comprehensive germplasm evaluation.

In the case of *Stylosanthes seabrana*, the primary challenge lies in the dormancy associated with its hard seed coat, a common cause of poor and uneven germination. This dormancy restricts moisture access to the embryo, and the presence of natural germination inhibitors further delays the germination process. FeNPs (iron nanoparticles) are known for their ability to create minute pores on the seed surfaces, which enhance water and nutrient absorption. They also generate hydroxyl radicals that aid in cell wall relaxation. Additionally, nano-priming expedites starch hydrolysis, nourishing the developing embryo, releasing seed dormancy, promoting germination, and influencing the biochemical parameters of the seed (Nile *et al*., 2022) [6].

Materials and Methods

The present lab study was under taken during 2022-23. Green synthesis of FeNPs was carried out in the Green Nanotechnology Laboratory from the drumstick (*Moringa oleifera*) leaves. The analysis of biochemical parameters was carried out at IABT, University of Agricultural Sciences, Dharwad, Karnataka. Dehydrogenase activity was determined by using the tetrazolium (TTC) staining method (Kittoch and Law, 1968) [3] and alpha amylase activity was determined by DNSA method. Protein estimation was done by FCR method (Lowry *et al*., 1951) [5].

Treatment details

The genotypes used in this experiment are *S. seabrana* – 2523, *S. seabrana* – 2534, *S. seabrana* -104710, *S. seabrana* – 11595, *S. seabrana* - MPKV Rahuri-1, *S. seabrana* - MPKV Rahuri-2, *S. seabrana* - Phule Kranti (Check). All the genotypes seeds are exposed to 80 ppm FeNPs for 12 hours followed by shade drying.

Results and Discussion

The data presented in Table 1 and Fig 1. Illustrates the influence of 80 ppm-FeNPs on the TDH activity and alpha amylase activity of seven *S. seabrana* genotype seeds. untreated seeds have shown significantly lower enzyme activity compared to FeNPs treated seeds.

Among the 80 ppm FeNPs treated seeds, *S. seabrana*-11595 and *S. seabrana*-104710 exhibited significantly elevated TDH activity, with values of 1.284 and 1.183 respectively. While significantly lower level of enzyme activity (0.929) was recorded in *S. seabrana*- 2523 compared to their respective control groups, the same trend has been followed in case of alpha amylase activity, where *S. seabrana*-11595 and *S. seabrana*-104710 recorded the amylase activity of 1.21 micro mol/min/mg of protein and 1.13 micro mol/min/mg of protein whereas, significantly lowest alpha amylase activity of 0.95 micro mol/min/mg of protein was observed in *S. seabrana* - MPKV-Rahuri.

The presence of iron plays a significant role in stimulating plant growth by activating multiple enzymes, facilitating RNA synthesis, and enhancing the efficiency of photosystems within plants. Iron is a crucial micronutrient metal that acts as a co-factor for a majority of dehydrogenase enzyme complexes responsible for seed germination and the mobilization of stored food (Sridhar, 2012) [7]. The enhanced availability of these micronutrients at the nanoscale, coupled with heightened chemical reactivity, results in an increase in the synthesis and activity of dehydrogenase enzymes and the α-amylase enzyme (Vijayalaxmi *et al.*, 2013; Korishettar *et al.*, 2016) [8, 4].

Table 1: Effect of FeNPs on selected biochemical parameters of *Stylosanthes seabrana* genotypes

Genotypes (G)	Total dehydrogenase enzyme activity @ 470 nm			Alpha-amylase activity (micro mol/min/mg of protein)		
	Factor I (Genotypes)	Untreated seeds	80 ppm FeNPs treated seeds	Factor I (Genotypes)	Untreated seeds	80 ppm FeNPs treated seeds
S. seabrana- 2523	0.768	0.607	0.929	0.87	0.84	0.89
S. seabrana - 2534	0.942	0.92	0.965	0.93	0.89	0.96
S. seabrana -104710	0.967	0.831	1.183	1.05	0.96	1.13
S. seabrana -11595	1.007	0.649	1.284	1.11	1.01	1.21
S. seabrana - MPKV Rahuri-1	0.796	0.714	0.930	0.86	0.82	0.9
S. seabrana - MPKV Rahuri-2	0.822	0.651	0.941	0.84	0.83	0.85
S. seabrana - Phule Kranti	0.943	0.938	0.946	0.87	0.85	0.89
Factor II (Treatments)	-	0.702	0.923	-	0.89	0.98
	S.Em ±	**CD @ 0.01**		**S.Em ±**	**CD @ 0.01**	
Genotypes	0.011	0.058		0.014	0.061	
Treatments	0.004	0.029		0.004	0.034	
Interaction (G×T)	0.018	0.084		0.021	0.098	

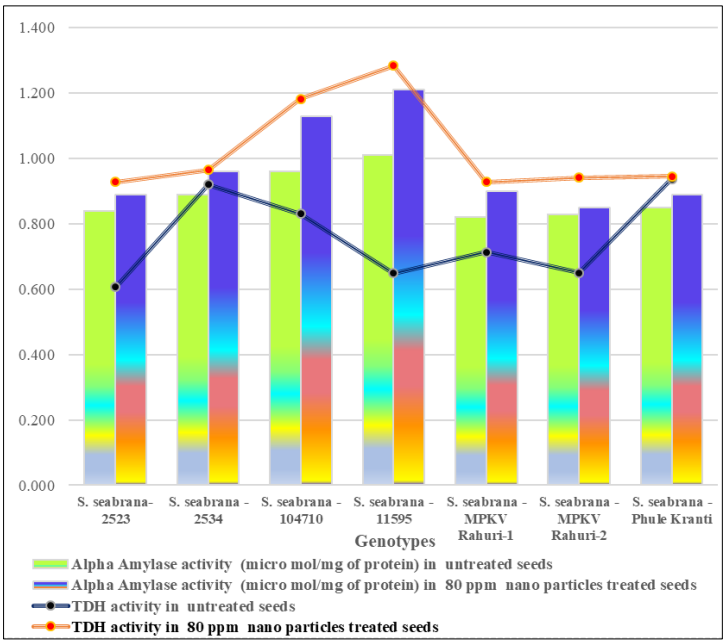

Fig. 1: Effect of FeNPs on selected biochemical parameters of *Stylosanthes seabrana* genotypes

Conclusion

The results obtained illustrates a clear need for seed pre-treatment using iron nanoparticles to enhance the seed biochemical parameters of *S. seabrana* genotypes. Among seven genotypes *S. seabrana*-11595 and *S. seabrana*-104710 have performed well with enhanced enzyme activity due to which intern helps in the improved seed quality.

References

1. Anonymous. Annual Report, Department of Animal Husbandry, Dairying and Fisheries, Ministry of Agriculture and Farmers Welfare, Government of India; c2021.
2. Cameron DF. To breed or not to breed: In genetic resources of forage. Australian Journal of Experimental Agriculture and Animal Husbandry, (Melbourne: CSIRO). 1983;3(1):237-250.
3. Kittock DL, Law AG. Relationship of seedling vigour to respiration and tetrazolium chloride reduction by germination wheat seeds. Agronomy Journal. 1968;60:286-288.
4. Korishettar P, Vasudevan SN, Shakuntala NM, Doddagoudar SR, Hiregoudar S, Kisan B. Seed polymer coating with Zn and Fe nanoparticles: An innovative seed quality enhancement technique in redgram. Journal of Applied and Natural Science. 2016;8(1):445-450.
5. Lowry OH, Roserbrough NJ, Farr AL, Randall RJ. Protein measurement with folin-phenol reagent. Journal of Biological Chemistry. 1951;193:265-275.
6. Nile SH, Thiruvengadam M, Wang. Nano-priming as emerging seed priming technology for sustainable agriculture-recent developments and future perspectives. Journal of Nanobiotechnology. 2022;20:254-270.
7. Sridhar C. Effect of nanoparticles for the maintenance of tomato seed vigour and viability. M.Sc. (Agri.) Thesis, TNAU, Coimbatore (India); c2012.
8. Vijayalaxmi V, Ramamoorthy K, Natarajan N. Effect of nanoparticle (TiO_2) on naturally aged seeds of maize (*Zea mays* L.). Paper presented in: 13th National Seed Seminar, Innovations in Seed Research and Development, UAS, Bangalore; c2013 June 8-10. p. 90.