INTERNATIONAL CONFERENCE ON BIOLOGICAL RESEARCH AND APPLIED SCIENCE (IBRAS)

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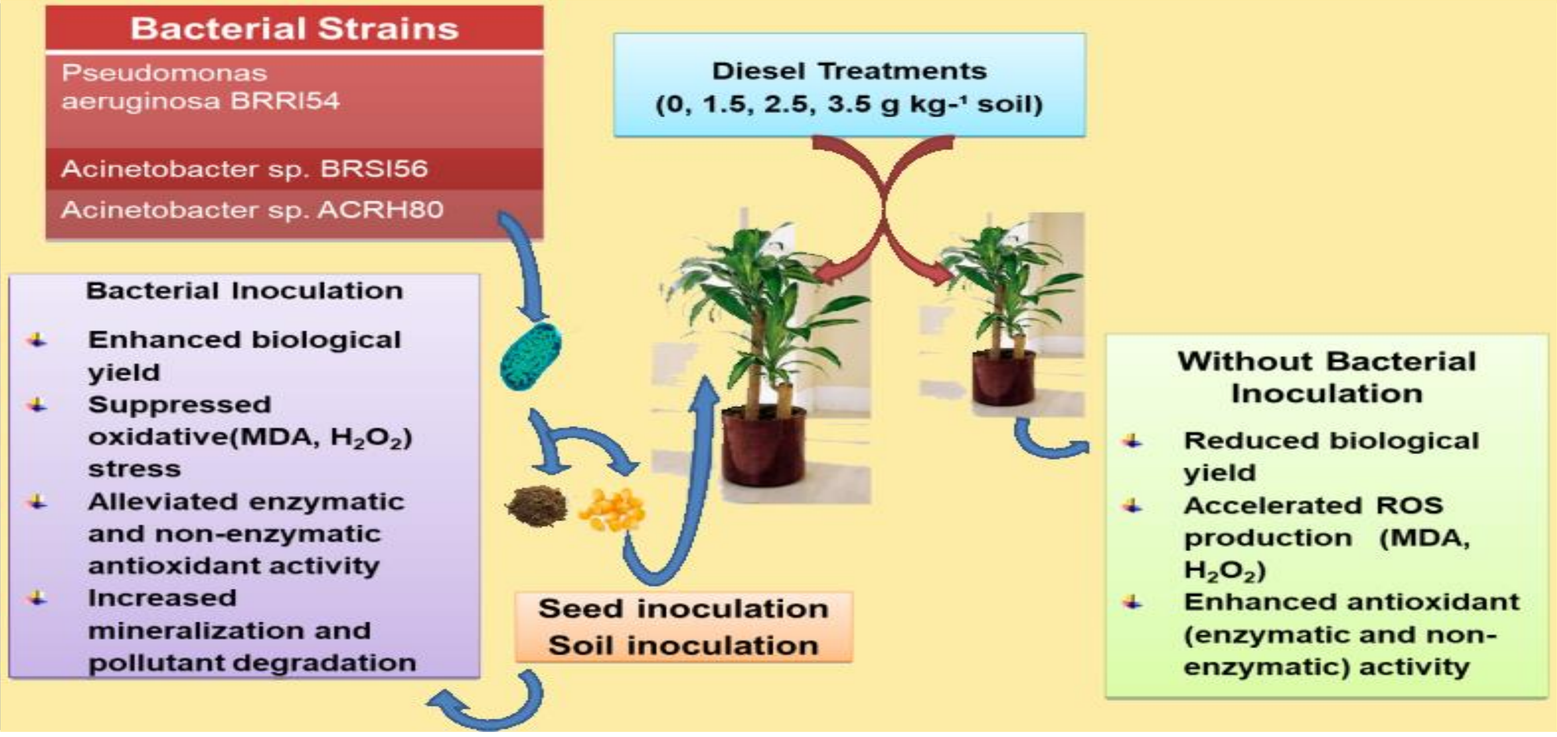


Discussion

The results of present study reveal that antioxidative system, either as enzymatic and/or non-enzymatic has the potential capacity to decrease obnoxious effects of polycyclic aromatic hydrocarbons, by employing the effective plant-microbe association in the rhizosphere. Among the antioxidant enzymes, GR, APX, POD, CAT work in conversion of H_2O_2 to H_2O and O_2 (Gill &Tuteja, 2010) . The potential reduction in antioxidative system activity upon bacterial inoculation indicating that plant-microbe association in the rhizosphere provides protection against diesel stress and improving growth and development of plants (Agnello et al 2016, Balseiro-Romero et al 2017, Pandey et al 2016, Souza et al 2015, Sun et al 2018, Tittabutr et al 2013) .

Methods and Materials

Experimental design:

- A pot experiment was designed to investigate the effect of diesel contamination on morphological and biochemical parameters of maize with or without bacterial inoculation. The pots contained 6 kg soil pot^{-1}.
- The bacterial strains used in this study were Pseudomonas aeruginosa BRRI54, Acinetobacter sp. ACRH80 and Acinetobacter sp. BRSI56. The strains P. aeruginosa BRR154and Acinetobacter BRSI56 were isolated from the root and shoot of Brachiaria mutica, respectively, whereas Acinetobacter sp. strain ACRH80 was isolated from the rhizosphere of Acacia ampliceps.
- Biomass, enzymatic antioxidants (catalase, ascorbate peroxidase, superoxide dismutase, peroxidases, glutathione reductase), non-enzymatic antioxidant (reduced glutathione, ascorbic acid, α-tocopherol, Proline), and hydrogen peroxide and malondialdehyde were done.

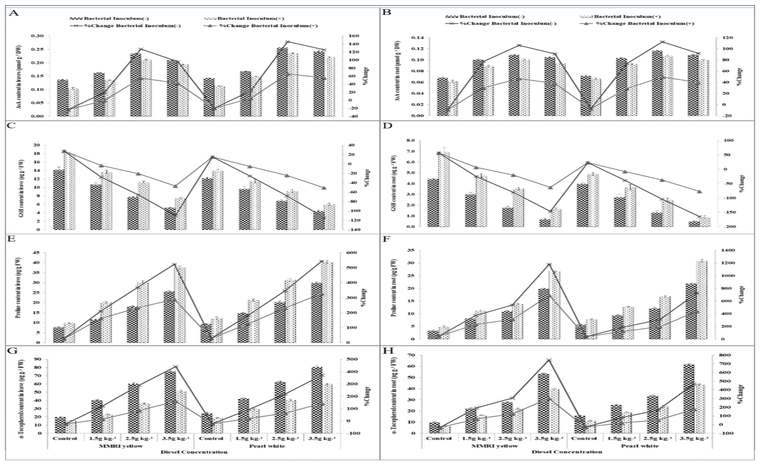
Table 1. Effect of varying diesel regimes on biomass of Zea mays L..

Variety	Treatment	Hydrocarbon concentration (g kg^{-1} soil)	Shoot		Root	
			Fresh weight	Dry Weight	Fresh weig	Dry Weight
MMRI yellow	Bacterial Inoculation	0	50.11 ±1.19a	6.99 ±0.16a	24.57 ±0.47a	3.83±0.08a
		1.5	38.89 ±0.78c	5.71 ±0.13c	14.69 ±0.29c	2.36 ±0.05c
		2.5	34.07 ±0.81d	4.91 ±0.14d	12.31 ±0.51d	1.98 ±0.09d
		3.5	23.98 ±1.03f	3.59 ±0.16f	10.41 ±0.35e	1.74 ±0.06e
	Without Bacterial Inoculation	0	41.75 ±0.71b	6.59 ±0.13b	19.07 ±0.31b	2.85 ±0.05b
		1.5	30.35 ±1.06e	4.68 ±0.17e	11.91 ±0.38d	1.93±0.06d
		2.5	20.27 ±0.56g	3.43 ±0.07g	10.06 ±0.37e	1.75 ±0.02e
		3.5	15.97 ±0.51h	2.85 ±0.06h	8.16 ±0.48f	1.31 ±0.08f
Pearl white	Bacterial Inoculation	0	44.98 ±1.03a	6.69 ±0.14a	21.03 ±0.58a	3.07 ±0.08a
		1.5	36.78 ±0.34c	5.51 ±0.06c	13.01 ±0.46c	2.08 ±0.06c
		2.5	27.99 ±0.46d	3.98 ±0.08d	11.02 ±0.53d	1.79 ±0.09d
		3.5	19.96 ±0.75f	3.08 ±0.13f	9.07 ±0.45e	1.56 ±0.05e
	Without Bacterial Inoculation	0	39.58 ±0.46b	5.83 ±0.07b	15.97 ±0.65b	2.51 ±0.08b
		1.5	24.89 ±0.66e	3.59 ±0.14e	10.11 ±0.19d	1.59±0.04de
		2.5	19.61 ±0.27f	2.78±0.06f	9.13 ±0.11e	1.41 ±0.03e
		3.5	14.17 ±0.23g	1.99 ±0.05g	7.06 ±0.21f	1.09 ±0.04f

Results

The results of our study showed that production of biomass was appreciably affected due to differential treatments of diesel oil (0, 1.5, 2.5, 3.5 g kg^{-1} soil) in both varieties of maize.
The accumulation of excessive quantities of ROS cause damage to biofilms, and lead to lipid peroxidation. Our results showed that MDA content increased in leaves and root of both varieties with an increase in the diesel concentration (0, 1.5, 2.5, 3.5 g kg^{-1} soil), the highest rate was of MDA was observed when diesel apply @ 3.5 g kg^{-1} soil. Whereas bacterial inoculation alleviated the enzymatic and non-enzymatic antioxidant activities in the both leaves and root organ of both maize varieties.

Figure 1. Effect of varying diesel regimes on AsA , proline and α-Toco on maize



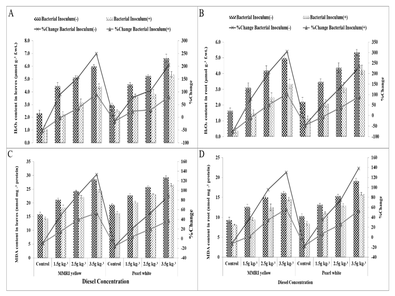


Figure 2. Effect of varying diesel regimes on H_2O_2 and MDA on maize

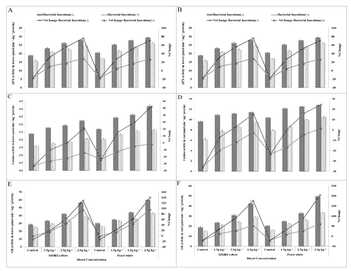


Figure 3. Effect of varying diesel regimes on APX, CAT, GR on maize

Conclusions

The research study proved that bacterial inoculation under diesel stress significantly enhanced various enzymatic and non-enzymatic antioxidants in maize. Plant-bacteria interaction may reveal that various physiological and biochemical mechanisms that bacterial inoculation may mediate plant antioxidative response to reduce drastic effects of reactive oxygen species which are produced under hydrocarbon stress condition. However, this research revealed that bacterial inoculation has the potential to enhance plant growth of both varieties under control and diesel stress conditions and provide a picture of the antioxidative defense system under hydrocarbon stress. In the future, further studies are needed to evaluate the role of different bacteria genes involved in plant growth promotion.

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