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土壤盐分：一个严重的环境问题和促进植物生长的细菌作为其缓解工具之一

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摘　要：盐分是限制农作物生产力的最残酷的环境因素之一，因为大多数农作物对土壤中高浓度盐分引起的盐分敏感，受盐分影响的土地面积日益增加。对于所有重要作物，平均产量只是其中的一小部分——在创纪录产量的 20% 到 50% 之间；这些损失主要是由于干旱和高土壤盐分造成的，由于全球气候变化，许多地区的环境条件将恶化。需要广泛的适应和缓解战略来应对这些影响。有效的资源管理和作物/牲畜改良以发展更好的品种有助于克服盐分压力。然而，这种策略是长期制定且成本密集的，因此需要开发用于盐分胁迫管理的简单且低成本的生物方法，该方法可在短期基础上使用。如果我们利用微生物的独特特性，例如对盐碱条件的耐受性、遗传多样性、相容溶质的合成、植物生长促进激素的产生、生物防治潜力以及它们与农作物的相互作用，微生物可以在这方面发挥重要作用。
关键词：盐度、耐盐性、PGPR、微生物

Soil salinity: A serious environmental issue and plant growth promoting bacteria as one of the tools for its alleviation

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Abstract: Salinity is one of the most brutal environmental factors limiting the productivity of crop plants because most of the crop plants are sensitive to salinity caused by high concentrations of salts in the soil, and the area of land affected by it is increasing day by day. For all important crops, average yields are only a fraction – somewhere between 20% and 50% of record yields; these losses are mostly due to drought and high soil salinity, environmental conditions which will worsen in many regions because of global climate change. A wide range of adaptations and mitigation strategies are required to cope with such impacts. Efficient resource management and crop/livestock improvement for evolving better breeds can help to overcome salinity stress. However, such strategies being long drawn and cost intensive, there is a need to develop simple and low cost biological methods for salinity stress management, which can be used on short term basis. Microorganisms could play a significant role in this respect, if we exploit their unique properties such as tolerance to saline conditions, genetic diversity, synthesis of compatible solutes, production of plant growth promoting hormones, bio-control potential, and their interaction with crop plants.
Keywords: Salinity, Salt-tolerant, PGPR, Microorganisms

引言：

SOC

SOC

一、土壤盐渍化问题

(PAHs)

21 20%

(ECe) (EC) 25 ° C 4 dS m-1 (
40 mM NaCl) 15 %
ECe ECe
20% 33%
/
/ /
10%
2050 50%

/ 10
7%
Oryza sativa L. Triticum aestivum 10 20
L. Zea mays L. 700
50% 2050 UP.

二、盐度对植物的影响

——

(PGPR)

N Ca K P Fe Zn

(P) Ca

II

四、使用耐盐作物和转基因

“ ”

K+ Na+ Na+
Cl- K+
Na+ tRNA
K+

100-175 mM NaCl

Na+ Cl- 50 30 mM
Munns Rawson 1999

25

(1980)

DNA RNA

三、盐度的改善

pH
/

PGPR P. alcaligenes PsA15
Bacillus polymyxa BcP26 Mycobacterium phlei MbP18

Kohler 2009
AM Glomus intraradices G.
mosseae PGPR P. mendocina

P. mendocina
PGPR

PGPR

PGPR

PGPR

六、根际细菌对植物非生物胁迫的缓解

NaCl CaCl2 CaSO4 Na2SO4
pH

五、微生物：农作物中的非生物胁迫缓解工具

.

(PGPB)

/ PGPR
PGPB

PGPR
(IST) PGPR PGPR
(ABA)
PGPR PGPR
Achromobacter piechaudii ARV8 1- -1-
(ACC) IST
/
AM
Kohler 2006
PGPR Pseudomonas mendocina

Nia et al., 2012

ACC ACC

ACC

N

Sadeghi 2012

(EPS)

EPS

Na+

Chen 2007

proBA N P Fe Mn

Ramadoss 2013

80 160 320 mM

71.7%

Hallobacillus sp 320 mM NaCl

Yao 2010 B. halodenitrificans 90%

Rs 198 17.4% NaCl

Tank Saraf (2010)

PGPRs

2% NaCl

Naz 2009 PGP

Khewra

ABA

结论

/ Upadhyay 2011

PGPR

Jha et al., 2011

P. pseudoalcaligenes

P.

pseudoalcaligenes

P. pseudoalcaligenes

B. pumilus

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