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Research Article

Assessment of Plant Growth Promoting and Abiotic Stress Tolerance Properties of Wheat Endophytic Fungi

Farhana Alam Ripa, Wei-dong Cao, Shuai Tong, and Jian-guang Sun

Key Laboratory of Microbial Resources, Ministry of Agriculture/Institute of Agricultural Resources and Regional Planning, Chinese Academy of Agricultural Sciences, Beijing 100081, China

Correspondence should be addressed to Jian-guang Sun; sunjianguang@caas.cn

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The aims of the present work were to isolate and characterize fungal endophytic communities associated with healthy wheat (*Triticum aestivum L.*) plants, collected from the North China. Segregated endophytes were screened for their PGP traits, abiotic stresses (heavy metals, salinity, drought, and temperature), and antibiotic sensitivity. A total of 16 endophytic fungi were isolated using the culture-dependent approach from different tissue parts of wheat plants. Based upon their internal transcribed spacer (ITS) rDNA gene sequencing, 15 out of 16 isolates were selected for further analysis. In the contemporary investigation, a number of the tested endophytes exhibited fairly good 1-aminocyclopropane-1-carboxylic acid deaminase (ACCD) (0.03±0.011 to 1.43±0.01 μmol α-KB mg^{-1} protein hr^{-1}), indole acetic acid (IAA) (1.125±0.04 to36.12±0.004$\mu g ml^{-1}$), and phosphate solubilizing index (PSI) (2.08±0.03to5.16±0.36) activities. More than 30% isolates gave positive result for siderophore and ammonia tests, whereas all exhibited catalase activity but only 2 (582PDA1 and 582PDA11) produced hydrogen cyanide. *Trichoderma* strains showed salt, heavy metals, and drought tolerance at high levels and also exhibited resistance to all the tested antibiotics. Strain 582PDA4 was found to be the most temperature (55°C) tolerant isolate. The findings of this study indicated that the microbial endophytes isolated from wheat plants possessing a crucial function to improve plant growth could be utilized as biofertilizers or bioagents to establish a sustainable crop production system.

1. Introduction

Globally wheat is considered as one of the major cereal crops. According to Food and Agricultural Organization (FAO) of the United Nations, its demand will be amplified up to 746 million tons by 2020 [1]. This raise in production desires to be accomplished in spite of the budding challenges to modern agriculture as well as precincts in the application of pesticides [2], concerns about the accessibility and environmental impact of fertilizer inputs [3], and the potential harmful impacts of climate alteration on wheat yields and disease spectrum [4]. Cultivation of high yielding varieties of crops, rigorous cropping system, and unevenness use of chemical fertilizers are the core factors which develop nutrient discrepancy in soil, squat yield, shrinkage of soil fertility, and stumpy quality of food. Hence, it turns to a severe problem to develop sustainable tactics for mitigation of unfavorable effect of intensive practices used by peasants [5]. The question of primary production sustainability is heightened more for wheat. Agricultural scientists around the planet are working round the clock to look for novel options to enhance agricultural productivity, sustainability, but it undoubtedly represents an immense challenge for them. The use of beneficial microbial symbionts of plants with the objective of improving agricultural productivity is one of the most important sustainable practices [6]. Concerning to reduce the harmful effects of the conventional methods of agriculture; innovative schemes based on microbial inoculation are currently gaining more attention. Plants and microorganisms form a symbiotic alliance with reimbursement for both cohorts. Additionally, plant-microbe symbiosis influences plant growth and health which efficiently ameliorates agricultural traits and improve soil quality and nutrient cycling [7–9].

Normally a number of microbes are found to acquire nutrients for their continued existence through interaction