Advances in Crop Science and Technology
ISSN: 2329-8863
Short Communication Open Access

Application of SA-Loaded PAMPS Polymer Material Enhances Drought Resistance in Tobacco Seeds

Kenjal*

Department of Science and technology, Albania

Abstract

Drought is one of the most important stressors limiting the seed industry and agricultural production. The present study was carried out to generate new drought tolerant pellet seeds using a combination material with a super absorbent polymer, poly 2-acrylamide-2-methyl propane sulfonic acid hydrogel and a drought retardant. , salicylic acid. The optimized PAMPS hydrogel is obtained because the molar ratio of 2-acrylamido-2-methyl-propanesulfonic acid to potassium peroxydisulfate and N,N'-methylene-bis-acrylamide is 1:0.00046: 0.00134. The weight of the hydrogel after swelling in deionized water for 24 h reached 4306 times its own dry weight. The water retention rate of PAMPS was significantly higher than that of the control. It can retain up to 85.3% of its original weight after 30 minutes at 110°C; even at 25°C for 40 days, PAMPS maintained the RR at 33.67%. The decomposition rate of PAMPS gradually increased and reached about 30 ter when buried in soil or activated sludge for 60 days. Furthermore, the seed germination performance and seedling growth were better in the pellet treatments with the SA-containing PAMPS hydrogel under water pressure compared with the control. He suggested that the PAMPS hydrogel containing SA, a non-toxic super absorbent polymer, could be used as an effective drought resistant material applied to granular tobacco granules.

Keywords: Drought; Seed; Agricultural; Petrochemical industry; Hydrophilic polymers

Introduction

The tobacco plant is native to tropical and subtropical regions with its abundant rainfall, high humidity and very high water requirements. Most tobacco growing areas often lack the necessary irrigation facilities; therefore, water shortage becomes a major stress factor with a high potential impact on tobacco yield. The seeding technique is a new method of seed treatment. At present, the planting rate of coated tobacco seeds in China has reached about 90%. Therefore, research and development of drought tolerant tobacco seeds is of great importance. To date, several studies on drought tolerant seeds have suggested adding some water absorbents in the potting medium. When the field is watered or rain comes, the suction pipe can draw water from the soil to form a small "reservoir", and the stored water will drain out of the small "reservoir" for use by the seeds or seedlings when the soil is too old. dried. Dried.to achieves drought resistance [1]. However, the water absorption rate of traditional water absorbents, such as polyacrylate and acrylic copolymers, is usually in the tens to hundreds; the limited ability to absorb water cannot fully play the role of a small "reservoir". Moreover, this is only a physical method to improve the drought resistance of seeds, and the absorbent hardly acts as a "reservoir" in case of lack of rain or lack of irrigation water; The application of gourd seeds in arid, semi-arid or other regions with less rainfall is limited. Therefore, the combination of water-absorbing and drought-tolerant agents to form new drought-resistant materials is particularly important to ensure maximum seed germination and seedling formation under water stress. Superabsorbent polymers are novel functional polymer materials containing strongly hydrophilic groups capable of absorbing and retaining extremely large amounts of liquid relative to their own mass. Based on the characteristics of high water absorption rate and good water holding capacity, they are widely applied in agriculture, forestry, horticulture, petrochemical industry, medical health, environmental management and other areas. 2-Acrylamide-2-methyl propane sulfonic acid is a kind of multifunctional water-soluble anionic monomer [2-5]. Due to the molecular structure of vinyl functional group and unsaturated double bonded sulfonic acid with strong anion and hydrophilicity, AMPS has good polymerization performance and water absorption rate of its polymers; it is known as a super absorbent resin and can be thousands of times its own dry weight in general. AMPS monomer has been widely applied in the synthesis of water treatment agents, adsorption and separation materials, as well as highly efficient water absorption and retention materials. However, at present, information about the application of AMPS monomer on granulation is lacking in the literature. Salicylic acid is considered an endogenous plant growth regulator that plays an important role in abiotic stress signaling in plants. An improvement in drought resistance induced by exogenous SA has been observed in many crops such as maize, wheat and rice. In one study, soaking soybeans in salicylic acid induced a positive effect on the accumulation of certain ions and antagonists, or modulated the inhibitory effect on dehydration-induced stress. Sharafizad found that soaking wheat seeds with low concentrations of SA at low water pressure could reduce germination time and increase germination rates. However, the effect of charged SA in superabsorbent polymers on crop drought tolerance has not been reported [6-11]. Poly 2-acrylamide-2-methyl propane sulfonic acid hydrogel was prepared and its synthetic formulation was optimized in this study. Due to its high water absorption capacity and unique three-dimensional lattice structure, PAMPS hydrogel is considered as a controlled release material by controlling SA release from coating agent and further improving the drought tolerance of seedling. Therefore, PAMPS hydrogel was used in this study to determine the performance of the super absorbent resin, and SA was used as an anti-drying chemical incorporated into the PAMPS resin. Next, the effect of increasing anti-dryness of PAMPS hydrogel loaded with SA as coating was investigated.

***Corresponding author:** Kenjal, Department of Science and technology, Albania, E-mail: ken@gmail.com

Received: 01-May-2023, Manuscript No: acst-23-98553, **Editor assigned:** 03-May-2023, PreQC No: acst-23-98553 (PQ), **Reviewed:** 17-May-2023, QC No: acst-23-98553, **Revised:** 19-May-2023, Manuscript No: acst-23-98553 (R) **Published:** 26-May-2023, DOI: 10.4172/2329-8863.1000580

Citation: Kenjal (2023) Application of SA-Loaded PAMPS Polymer Material Enhances Drought Resistance in Tobacco Seeds. Adv Crop Sci Tech 11: 580.

Materials

"Honghua Dajinyuan" and "MSk326" tobacco beads, talc and bentonite polish, and binder were provided by Yunnan Provincial Academy of Tobacco Agricultural Sciences, China. 2-Acrylamido-2-methylpropane sulfonic acid and salicylic acid were purchased from Shanghai Wing Science and Technology Co., Ltd., Shanghai, China [12]. Potassium persulfate, N, N′-methylene-bi, NaCl and NaOH were obtained from Shanghai Dingguo Biotechnology Co., Ltd., Shanghai, China. All chemicals were used as received and experiments were performed with double distilled water.

Water retention determination

First, two grams of tobacco seeds were coated with purified water and the above granulators in a cyclically alternating pattern until the particle size reached 1.00 ~ 1.25 mm in diameter. Total 5~8ml of water per gram of pulverized bare tobacco seeds; then a second layer of granulator and binder solution is provided cyclically until the particle size is 1.60~1.80mm in diameter [13-15]. All seeds were pelletized using a minitype coating machine "BY300A" and air-dried for 2 days at room temperature.

Discussion

In this study, the super absorbent PAMPS hydrogel was best according to 1: 0.00046: A ratio of 0.00134 of AMPS monomer to KPS and MBA was prepared. It should be noted that when applying a suitable transformer, the liquid absorption rate of PAMPS can be improved by increasing KPS; however, it will be inhibited after using an inappropriate amount of BMA. The results show that the MBA plays an important role in the preparation of the PAMPS hydrogel having a more or less important density network, which is responsible for the swelling degree of the resulting hydrogel. Also found a significant effect of crosslinking density on the water content of AMPS-based hydrogels. The main FTIR absorption peaks of PAMPS are in agreement with the related reports and there are no other impurity peaks. It is reasonable to conclude that PAMPS was successfully polymerized by the synthetic route. The water absorption rate can reach 4306 times of its own dry weight, which is much higher than other materials such as keratin hydrogel, polyacrylic acid sodium salt and starch based super absorbent. This may be because linear polymers with sulfonate groups derived from AMPS exhibit significant coil expansion in aqueous solution, even in 5 M NaCl solution. AMPS dissociates completely over the range. Overall pH and AMPS-derived hydrogels exhibit pH-independent swelling behavior. Therefore, the PAMPS hydrogel prepared in this study is thought to be adaptable to different pH conditions. However, it still deserves further study. PAMPS exhibits slow decomposition in soil; two months later, about one-third of the weight of PAMPS decomposes and eventually decomposes into nitrogen dioxide, water, ammonia nitrogen and sodium ions, etc. This means it is non-toxic and safe for the environment. Meanwhile, the above feature of PAMPS has enhanced the validity period and is effective in practice. So far, China's super absorbent polymer products have been widely used in food crops, economic crops, vegetables, flowers, fruit trees, grass growing, etc. and has been shown to be effective.

However, it remains unclear whether PAMPS is suitable for granulation or can improve the drought resistance of tobacco seeds as a small 'reservoir' without interference of polishing agents. Therefore, it is necessary to study the effects of different embedding agents, including PAMPS, on the establishment of tobacco seedling. The results showed that PAMPS alone could improve seed germination and seedling growth during drought, even the increase in GP, GI and VI of seeds reached significant levels compared with the control. He suggested that the moisture absorbed by the soil polymer could be used gradually during the seedling development stages. Similar results have also been reported in soybean seeds coated with superabsorbent starch grafts and corn kernels coated with high sodium polyacrylic acid hydrophilic polymers.

Conclusion

In fact, with its distinctive "reservoir" feature, the SA-containing PAMPS hydrogel exhibits a potential dual effect in improving the drought tolerance of tobacco seeds and seedlings. This granulation method with improved drought resistance function can become a new method to improve granulation under extreme conditions. However, this method has not been verified in other seed crops; or it will be necessary to develop this method with different chemicals to be made in the stress resistance of plants.

References

1. Ai Y, Liang D, Wilusz J E (2022) CRISPR/Cas13 effectors have differing extents of off-target effects that limit their utility in eukaryotic cells. Nucleic Acids Res 50: 11-95.
2. Anders C, Bargsten K, Jinek M (2016) Structural plasticity of PAM recognition by engineered variants of the RNA-guided endonuclease Cas9. Mol Cell 61(6): 895-902.
3. Bandyopadhyay, R. (2009) Xanthomonas Wilt: A threat to banana production
4. Bao A, Burritt D J, Chen H, Zhou X, Cao D et al. (2019) The CRISPR/Cas9 system and its applications in crop genome editing. Crit Rev Biotechnol 39(3): 321-336.
5. https://hos.ifas.ufl.edu/
6. https://nduat.org/Doc/anduat.pdf
7. Sintayehu D W (2018) "Impact Of Climate Change On Biodiversity And Associated Key Ecosystem Services In Africa: A Systematic Review." Ecosystem Health And Sustainability 4(9): 225-239.
8. Rosell S (2011) "Regional Perspective On Rainfall Change And Variability In The Central Highlands Of Ethiopia, 1978-2007." Applied Geography 31(1): 329-338.
9. https://books.google.co.in/books?hl=en&lr=&id=aJTBQAAQBAJ&oi=fnd&pg=PA1142&dq=6.%09Barros,+V.+R.,+C.+B.+Field,+D.+J.+Dokken,+M.+D.+Mastrandrea,+K.+J.+Mach,+T.+E.+Bilir,+M.+Chatterjee,+K.+L.+Ebi,+Y.+O.+Estrada+And+R.+C.+Genova+(2014).+Climate+Change+2014+Impacts,+Adaptation,+And+Vulnerability+Part+B:+Regional+Aspects:+Working+Group+II+&ots=v2SwJP6cEI&sig=OVG1IMkaFRqVtgHaAHY7gKDGXJo&redir_esc=y#v=onepage&q&f=false.
10. Mulenga BP, AWineman, NJ Sitko (2017) "Climate Trends And Farmers' Perceptions Of Climate Change In Zambia." Environmental Management 59(2): 291-306.
11. https://link.springer.com/article/10.1186/s40068-018-0115-z.
12. https://rmets.onlinelibrary.wiley.com/doi/abs/10.1002/joc.1052.
13. https://link.springer.com/chapter/10.1007/978-94-017-8026-1_3.
14. Baran T, UG Bacanli, F Dikbas (2017) "Drought Analysis With SPI Index And Entropy." European Water 60: 263-270.
15. Klutse NAB, Quagraine KA, Nkrumah F, Quagraine KT, Berkoh-Oforiwaa R (2021) "The Climatic Analysis of Summer Monsoon Extreme Precipitation Events Over West Africa In CMIP6 Simulations." Earth Systems Environment 5(1): 25-41.
16. https://www.tandfonline.com/doi/abs/10.1080/02723646.2019.1698094.