Silver Thiosulfate (STS) Solution Preparation and Application

Objective:

Induce male flower development in genetically female hemp plants. This will allow for inbreeding of female hemp plants.

Supplies:

Silver nitrate 99%, (169.87 g/mol), Sigma Item: 209139
Sodium thiosulfate 99%, (158.11 g/mol), Sigma Item: 217263
Reverse osmosis (RO) or deionized (DI) water
1 L flasks
500 ml spray bottle
Precision balance accurate to 0.01 g
Weigh boats or weigh paper
200 ul pipette and tips

Personal Protective Equipment:

Nitrile gloves
Safety goggles
Respirator for applications
Lab coat
Fume hood with good ventilation

Preparation:

1. Read and become familiar with the SDS sheets for silver nitrate and sodium thiosulfate.
2. Wear gloves, safety goggles, lab coat and work in the fume hood when preparing stock solutions.
3. Prepare 20 mM silver nitrate solution in a 1 L flask (3.40 g/L), store in a dark bottle or in the dark if possible or make solution the day it is used.
4. Prepare 20 mM sodium thiosulfate solution in a 1 L flask (3.16 g/L).
5. On the day of application, mix 20 ml of the 20 mM silver nitrate solution with 80 ml of 20 mM sodium thiosulfate solution in a 500 ml spray bottle. Change final volume as needed while maintaining the 1:4 ratio.
6. Mix 4 mM STS solution thoroughly.
7. Spray the uppermost raceme of plants with emerging flower primordia until slight runoff occurs.

8. Spray the complete contents of the bottle, do not reuse contents as the solution will quickly oxidize.
9. Freshly prepare and apply STS solution before transferring plants to 12-hour days, then once a week for two weeks, for a total of three applications.
10. When stigma primordia begin to appear, cover the plant with 15 uM fabric to ensure selfing.
11. It is possible to over apply STS and we have found female plants where every female flower had been converted into male flowers and no seeds were produced, so try to focus the application on only the top racemes.
12. Harvest seeds about 6-8 weeks after STS application, once seeds are fully mature and plants have dried down to below 10% moisture.

References:

Lubell J.D. and Brand M. H. 2018. Foliar Sprays of Silver Thiosulfate Produce Male Flowers on Female Hemp Plants. Horttechology 28(6) 743-747

Cameron A.C. and Reid M.S. 1981. The Use of Silver Thiosulfate Anionic Complex as a Foliar Spray to Prevent Flower Abscission of Zygocactus HortSci 16(6) 761-762