



## New approach for dry formulation techniques for rhizobacteria

A.A. Elchin (1), A.V. Mashinistova (1), N.V. Gorbunova (1), V.S. Muratov (1), K.A. Kydralieva (2), and Sh.J. Jorobekova (2)

(1) Institute of Applied Biochemistry and Machine-Building JSC "Biochimash", K.Tsetkin 4, Moscow 125299, Russia, (2) Institute of Chemistry and Chemical Technology, NAS, Laboratory of Biophysical Chemistry, Bishkek, Kyrgyzstan (k\_kamila@mail.ru, + 996 312 243607)

Two beneficial *Pseudomonas* isolates selected from rhizosphere of abundant weed - couch-grass *Elytrigia repens* L. Nevski have been found to have biocontrol activity. An adequate biocontrol effect requires high yield and long stability of the bacterial preparation [1], which could be achieved by an effective and stable formulation.

This study was aimed to test various approaches to dry formulation techniques for *Pseudomonas*- based preparations. To reach this goal, two drying formulation techniques have been tested: the first one, spray drying and the second, low-temperature contact-convective drying in fluidized bed. The optimal temperature parameters for each technique were estimated. Main merits of the selected approach to dry technique are high yield, moderate specific energy expenditures per 1 kg of evaporated moisture, minimal time of contact of the drying product with drying agent. The technological process for dry formulation included the following stages: the obtaining of cell liquids, the low-temperature concentrating and the subsequent drying of a concentrate.

The preliminary technological stages consist in cultivation of the rhizobacteria cultures and concentrating the cell liquids. The following requirements for cultivation regime in laboratory conditions were proposed: optimal temperatures are 26-28° in 3 days, concentration of viable cells in cell liquid makes 10<sup>10</sup>-10<sup>11</sup> cell/g of absolutely dry substance (ADS). For concentrating the cell liquids the method of a vacuum evaporation, which preserves both rhizobacteria cells and the secondary metabolites of cell liquid, has been used. The process of concentrating was conducted at the minimum possible temperature, i.e. not above 30-33°. In this case the concentration of viable cells has decreased up to 10<sup>9</sup>-10<sup>10</sup> cell/g of ADS.

For spray drying the laboratory up-dated drier BUCHI 190, intended for the drying of thermolabile products, was used. The temperatures of an in- and outcoming air did not exceed 50° and 38°, respectively. To enrich of dry product yield, 20% of sodium humate [2] was used as filling agent. As a result, concentration of viable cells in yield makes 10<sup>5</sup>-10<sup>6</sup> cell/g of ADS.

Low-temperature contact-convective drying in fluidized bed with use of preliminarily dried heat-carrier was evaluated at 25-30°. Granules of humic acids (d 3 mm) served as inert carrying agent. So, the concentration of viable cells in dry product makes 10<sup>8</sup>-10<sup>9</sup> cell/g of ADS.

The results presented demonstrated that fluidized bed drying technique applied on rhizobacteria-based BCA had higher beneficial effect in terms of high yield as compared to spray drying.

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