



Česká zemědělská univerzita v Praze

Fakulta agrobiologie,  
potravinových a přírodních zdrojů

DOKTORSKÝ STUDIJNÍ PROGRAM/ DOCTORAL STUDY PROGRAM

## NÁVRH TÉMATU/PROPOSAL OF THEME

Studijní program/*Study Program*: **Special Agricultural Science**

Studijní obor/*Branch of Study*: **Exploitation and Protection of Natural Resources**

Katedra/*Department of*: **Agroenvironmental Chemistry and Plant Nutrition**

Školitel (včetně titulů), email/*Supervisor*, email: **Prof. Dr. Pavel Tlustos, tlustos@af.czu.cz**

Konzultant (včetně titulů)/*Co-supervisor*: **Dr. Pavel Svehla**

Forma studia/*Form of Study*: **Full\_time**

Typ tématu/*Type of Theme*: **Framework**

### **Téma/Theme: Liquid Phase of Digestate Treatment Causing More Effective Utilization of Nutrients**

**Hypotéza/ Hypothesis:** We hypothesize that it is possible to develop suitable method for the treatment of liquid phase of digestate produced on agricultural biogas plants. This method will be able to significantly reduce nitrogen losses resulting from the handling with the digestate. Process based on biochemical oxidation of ammonia contained in the liquid phase of digestate (nitrification process) and subsequent thermal thickening of nitrified liquid phase of digestate seems to be very promising from this point of view. This method will be able to increase the amount of nitrogen transferred into the soil during the application of the liquid phase of digestate. Simultaneously, it will decrease atmosphere pollution by the ammonia and lead to other environmental and economic benefits.

**Anotace/Annotation:** Digestate produced during the operation of agricultural biogas plants is very heterogeneous material. By this reason, it is frequently separated into solid and liquid fraction. The liquid fraction contains relatively high concentration of ammonia which could reach up to several grams per liter. Simultaneously, the liquid phase of digestate contains also other nutrients such as phosphorus and potassium. At present, the liquid phase of digestate is usually on a relatively long term basis stored in the tanks situated in the area of the biogas plant and then it is applied to agricultural soil. However, low content of dry matter in the liquid phase of digestate increases the costs for storage and transport. Additionally, significant portion of ammonia contained originally in the liquid phase of digestate is volatilized. In such way, we loss valuable nutrient. At the same time, the environment is polluted by ammonia emissions.

The application of the method of the liquid phase of digestate treatment consisting of nitrification and subsequent thermal thickening of the nitrified liquid phase of digestate is able to reduce significantly the problems mentioned above. Practically all the nutrients contained in the liquid phase of digestate are concentrated in thickened nitrified liquid phase of digestate which could be used as complex liquid fertilizer. On the other hand, the distillate produced during thermal thickening of the liquid phase of digestate could be used as the process water e.g. for the optimization of dry matter content in the substrate entering anaerobic digestion process in biological reactor of given biogas plant. In contrast to other methods useful for liquid phase of digestate treatment, the process based on nitrification and subsequent thermal thickening is not connected with the production of wastewater.

The aim of this Ph.D. thesis is to suggest suitable methods for the optimization of both involved processes (nitrification and thermal thickening). For this purpose, the processes will be simulated in laboratory as well as in pilot scale conditions.

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Podpis/*Signature*: