

# COMPOUND FERTILIZERS GRANULATION USING BUCKWHEAT HUSK ASH

## Introduction

In the world alternative energy sources such as straw, husks and other combustible bio-waste are being sought. Every year in Lithuania, about 130–140 thousand tons of straw suitable for biofuel production are used. The reuse of biomass ash in agriculture has potential as raw materials of fertilizers.

## Results

### Chemical composition

Considering that the ecological buckwheat (JSC "Ekofrisa") husk ash contains 35–39 % soluble potassium (calculated as  $K_2O$ ) and about 6 % phosphorus soluble in mineral acids (calculated as  $P_2O_5$ ), but no nitrogen (Table 1).

After chemical analysis established other secondary nutrients in the ash: CaO, MgO,  $SO_3$  (Table 1).

Also were established the microelements in the ash: Zn, Mn, Cu, Fe, Co, Mo. Concentrations of heavy metals (Cd, Pb, Ni, Cr, Rb, Pb) which can limit the benefits of ash in agriculture are low, except for Rb (Table 1).

### Granulation of fertilizers

Primary pure ash was granulated as a binder using polyvinyl acetate (PVA) solutions of different concentrations (10, 20, 30 %), and obtained properties of the product: the quantity of marketable fraction (Fig.1) and strength of granules (Fig. 2). 20–60 % retour was used to improve the properties of granular ash (Fig. 1, Fig. 2). Because the ash does not contain nitrogen, were added materials which consists nitrogen and phosphorus (ammonium sulphate and ammonium hydrogen phosphate), and fertilizer were granulation (Fig. 3).

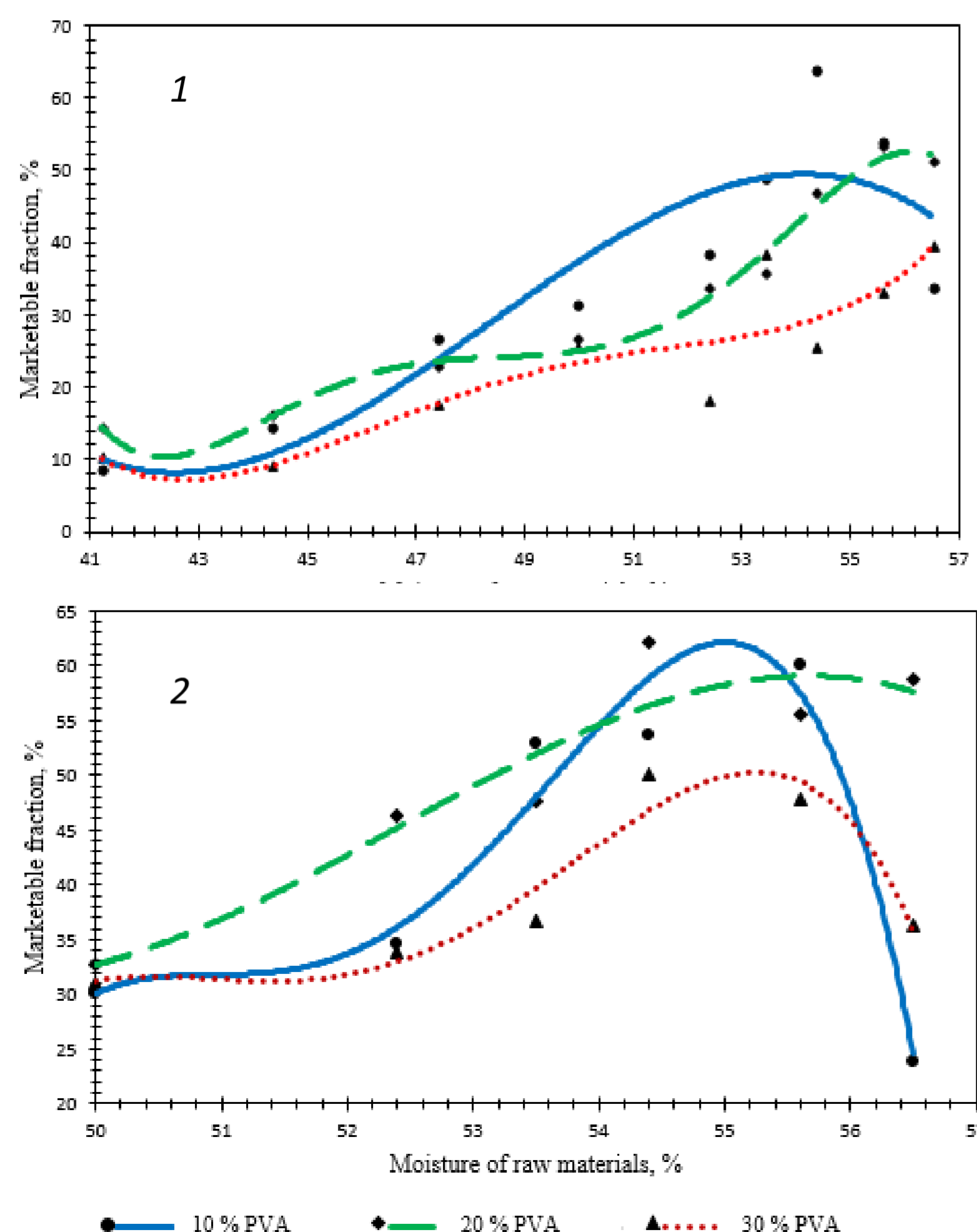


Fig. 1. Marketable fraction content using different concentrations of PVA: 1 – without retour; 2 – with 20 % retour

## Materials and Methods

Nitrogen content was determined by Kjeldahl method, potassium by using flame photometer. UV/Vis spectrophotometer was used to measure phosphorus concentration.

Fertilizers were granulated in a laboratory drum granulator – dryer (LDGD) based on the design and operation of industrial granulator's data.

Table 1. Concentrations of primary, secondary nutrients, microelements and heavy metals in ash

Primary and secondary nutrients, %					
$K_2O$	$P_2O_5$	CaO	MgO	$SO_3$	$Na_2O$
35-39	6	16.1–21,7	12,4	3,5	0,07
Microelements, mg/kg					
Zn	Mn	Cu	Fe	Co	Mo
441–659	2500–3949	124–293	5969–7850	7,6	9,3
Heavy metals, mg/kg					
Cd	Pb	Ni	Cr	Rb	Pb
1,8	<2,8	15,7	18,3	335	0,013

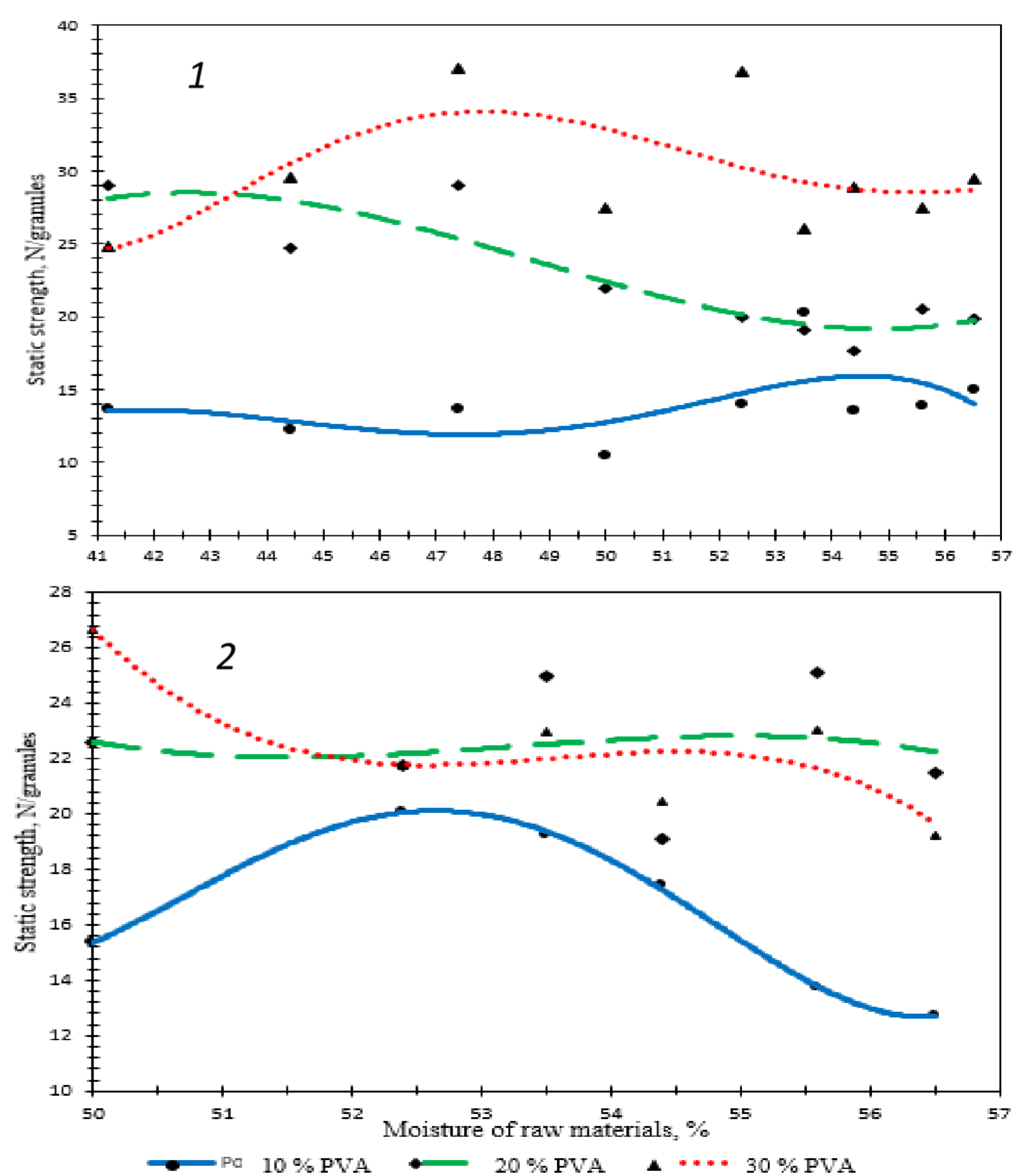


Fig. 2. Static strength of granules using different concentrations of PVA: 1 – without retour; 2 – with 20 % retour

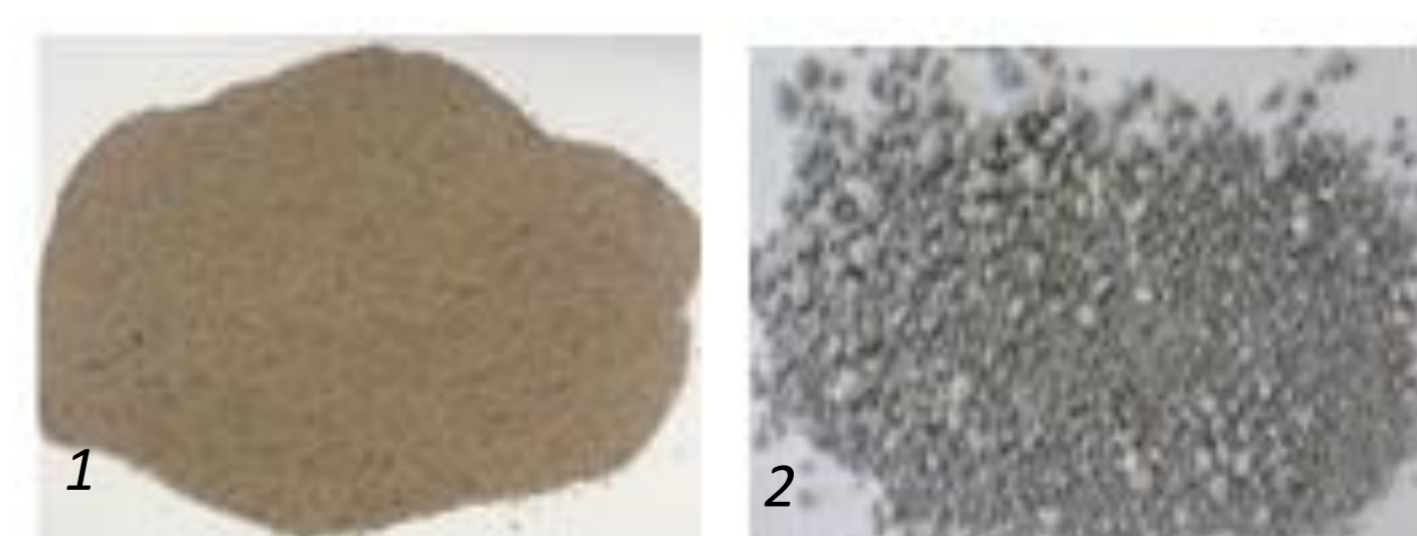


Fig. 3. Buckwheat husk ash: 1 – ash powders; 2 – fertilizers granules

## Conclusions

After granulation of compound fertilizers using different (20–60 %) retour content and different (20–24 %) moisture content, the largest part of the marketable fraction (2–5 mm granules) was up to 57 %.

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