Homa Farming - a vedic fire for agriculture: Influence of Agnihotra ash on water solubility of soil P

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Abstract

The influence of Agnihotra ash on the solubility of soil P was investigated applying three different extraction methods: 48-hour water extraction according to Lai (no year), 1-hour water extraction according to van der Paauw et al. (1971) and CAL-extraction according to Schüller (1969). Applying the 48-hour water extraction, it was found that Agnihotra-ash may increase the amount of extractable P in soil. However, this effect was also generated with a non-Agnihotra ash, which was produced without chanting a mantra, and not at sunrise or sunset. It was particularly strong when the non-Agnihotra ash was produced in a copper pyramid. The 1-hour water extraction according to van der Paauw et al. (1971) and the CAL-extraction were not suitable to replicate the effects observed in the 48-hour water extraction, i.e. no increase in the amount of extractable soil P was found in the ash treatments with these methods. A possible explanation may be the time of soil / ash contact, which may have been too short in the two latter extraction methods to allow the subtle energetic forces to unfold their effects.

Keywords: Agnihotra ash, homa farming, soil P solubility, soil P extraction methods

Zusammenfassung

Homa Farming - ein vedisches Feuer für die Landwirtschaft: Einfluss von Agnihotra-Asche auf die Wasserlöslichkeit von Phosphor im Boden

Anhand von drei verschiedenen Extraktionsmethoden wurde der Einfluss von Agnihotra-Asche auf die Löslichkeit von P im Boden untersucht: durchgeführt wurden eine 48-stündige Wasserextraktion nach Lai (ohne Jahr), eine 1-stündige Wasserextraktion nach van der Paauw et al. (1971) und eine CAL-Extraktion nach Schüller (1969). Die Ergebnisse der 48-stündigen Wasserextraktion zeigten, dass durch Agnihotra-Asche die Menge des löslichen P im Boden erhöht werden kann. Allerdings wurde eine ähnliche Wirkung auch bei der Kontrollasche beobachtet, die ohne das Singen eines Mantras und nicht zu Sonnenauf- oder –untergang erzeugt worden war. Besonders deutlich war der Effekt der Kontrollasche dann, wenn diese in einer Kupferpyramide hergestellt worden war. Weder die einstündige Wasserextraktion nach van der Paauw et al. (1971) noch die CAL-Extraktion waren geeignet, die bei der 48-stündigen Extraktion beobachteten Effekte zu replizieren, d.h. die Ergebnisse dieser beiden Methoden zeigten keinen Anstieg des löslichen P im Boden durch die Aschebehandlungen. Ein Erklärungsansatz könnte in der Dauer des Boden / Asche-Kontaktes liegen, die bei diesen beiden Methoden möglicherweise zu kurz war, um eine volle Entfaltung der feinstofflichen Kräfte der Agnihotra-Asche zu erlauben.

Schlüsselwörter: Agnihotra-Asche, Homa-Landwirtschaft, Löslichlichkeit des Boden-P, P-Extraktionsverfahren

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1 Introduction

Homa or Yajnya is a pyramid fire technique passed down from the ancient Atharva Vedas*. The technical term Yajnya denotes a process of removing the toxic conditions of the atmosphere through the agency of fire. The thereby healed and purified atmosphere is said to have beneficial effects on man, animals and plants (Paranjpe, 1989).

The ancient knowledge about the pyramid fire was newly revived in the middle of the 20th century by the Indian teacher Parama Sadguru Shree Gajanan Maharaj and his student, Shree Vasant V. Paranjpe. Today, it is mainly practiced by organic farmers in South America and India, but is also gaining increasing attention in North America and Europe.

The basic Homa, called Agnihotra (sanskrit: agni = fire, hotra = healing), is practiced in the rhythm of sunrise and sunset. A small fire is prepared from dried cow dung and clarified butter (ghee) in a copper pyramid. Some grains of unbroken whole brown rice are put into the fire accompanied by chanting a mantra. The ash produced by the fire is also accredited with having healing properties. Dissolved in water and sprayed onto plants, it is said to have fertilizing as well as plant protecting quality. Homa farming may be applied as a complementary method together with common methods of organic farming.

According to the ayurvedic medical doctor and scientist Priyadarshini (2005), the purification of the atmosphere through Homa leads to an intensification of life energy (= prana). It is postulated that plants under a Homa atmosphere develop cylindrical veins (vascular tissue or bundles) with an above average diameter, permitting water and nutrients to move faster, and thus supporting plant growth and reproduction. Furthermore, a stimulation of photosynthesis and plant respiration, which improves the entire oxygen cycle, is attributed to this atmosphere (Paranjpe, 1989).

A couple of reports from India, Peru, Venezuela, the United States and Austria, some of them including scientific documentation, give account of the beneficial effects of Homa farming on plant germination, development, health and pest resistance, as well as on yield and product quality (Atul et al., 2006; Bhujbal, 1981; Mutalikdesai, no year; Perales et al., 2000; Quintero, 1998; Schinagl, 2004). With regard to soil quality, an improved water holding capacity, an increase in amount and solubility (plant availability) of macro nutrients and trace elements and a stimulation of earth worm activity are postulated as a direct result of Homa treatment (Paranjpe, 1989).

The cited reports indicate to a strong potential of Homa farming for improving plant performance in an ecologically sound manner. However, a prerequisite for a broader acceptance of this technique is a clear scientific documentation based on replicable and exact experiments. While most of the above cited effects of Homa therapy have not yet been scientifically explained or proven, first investigations on the question of nutrient solubility with two Colorado soils revealed an increase in P solubility when the soils were treated with Agnihotra ash (Lai, no year). The aim of this study was to test if the results reported by Lai (no year) could be reproduced with a German agricultural soil under controlled laboratory conditions.

2 Materials and methods

In the original experiment described by Lai (no year), two types of ash were used to study their effect on water solubility of soil P: an Agnihotra ash produced as described above, and a non-Agnihotra ash, produced with the same ingredients in the same copper pyramid as the Agnihotra ash, but not at sunrise or sunset, and without chanting a mantra.

5 g soil were mixed with 0.1 g ash (Agnihotra / non-Agnihotra) and shaken in 25 ml water for 48 hours. The same amount of ash (Agnihotra / non-Agnihotra) was shaken without soil in 25 ml water for 48 hours. Finally, water soluble phosphate content was measured in the water solutions.

In the study presented here, a set of experiments was conducted based on the description given by Lai:

Experiment 1: This experiment was conducted exactly as described above, i.e. both Agnihotra (AA 1) and non-Agnihotra ash (NA 1) were produced in a copper pyramid (Table 1). 0.1 g ash were added to 5 g soil and shaken in 25 ml deionised water for 48 hours. As a test soil, a German agricultural soil (dystric cambisol / orthic luvisol; texture: silty-loamy sand, pH 5) was used. In addition to the ashes and soil-ash mixtures, 5 g of soil without ash were shaken in water in the same manner. After shaking, the soil-ash-water solutions were filtered using Sartorius folded filters (grade: 292), and P content was determined colorimetrically according to John (1970).

Experiment 2: In this experiment, the non-Agnihotra ash (NA 2) was produced in an iron vessel instead of a copper pyramid (Table 1), to investigate the influence of copper on the outcome of the experiment. Apart from this, everything else was done in the same manner as in experiment 1.

* The Vedas are one of the most ancient religious texts still in existence. Passed on by oral tradition for centuries, they were written down in Sanskrit starting in the second millennium B.C. The Atharva Vedas were written down around 200 B.C. and contain a collection of hymns, mantras, chants, incantations and metaphysical texts (see www.sacred-texts.com).

Experiment 3: In order to compare the extraction method described by Lai (no year) with extraction procedures common in Europe for the determination of plant available soil P, a third experiment was conducted applying the water extraction after van der Paauw et al. (1971) and the CAL extraction after Schüller (1969). In order to keep these extractions comparable to experiments 1 and 2, the same soil-ash ratio as in the "Lai experiment" (i.e. 50:1) was chosen for all extractions.

All treatments were performed in 3 replicates.

To determine total P, Cu and Fe contents, ashes were extracted with aqua regia according to DIN EN 13346. P analysis was done colorimetrically according to John (1970), while Cu and Fe were analysed by ICP-OES. In order to make the ashes comparable to conventional P fertilizers, their P solubility in citric acid (CA) and water (W) was assessed according to the instructions for fertilizer analysis by VDLUFA (1995) (Table 1).

For each experiment, differences between treatments (NA, AA, no ash) were tested statistically by ANOVA and Scheffé-post hoc test.

3 Results and discussion

In his original experiment, Lai (no year) found that the addition of Agnihotra ash (AA) increased the amount of water extractable soil P by a factor of 4 to 5 compared to non-Agnihotra ash (NA) (Table 2). A comparison with the amounts of water extractable P extracted from ashes shaken without soil shows that the amount of water extractable P in treated soils did not solely originate from the addition of the ashes to the soils. Unfortunately, Lai did not test the P solubility in his soils without the addition of ash.

In the study described here, the amounts of water extractable P were generally about 2 to 3 orders of magnitude

Table 1:
Description of ashes used in the experiments (mean values of 3 replicates)

	P_{AR}	P_{CA}		P_W		Cu	Fe
Ash type	mg/kg	mg/kg	% P_{AR}	mg/kg	% P_{AR}	mg/kg	mg/kg
AA 1	26338	19669	75	375	1.4	5626	29984
NA 1_{Cu}	26991	19675	73	363	1.3	465	14669
AA 2	20319	20431	100	74.7	0.37	4921	16718
NA 2_{Fe}	22498	21649	96	133	0.59	83	15082

AR = aqua regia, CA = citric acid, W = water / AA = Agnihotra ash, NA = non-Agnihotra ash

Table 2:
P solubility in experiments 1 and 2 in comparison to the "Lai experiment" (this study: mean values of three replicates)

		Water extractable P (mg P/0.1 g ash or mg P/5.1 g soil-ash mixture)			
Ash type	Soil yes/no	Lai Colorado 1	Lai Colorado 2	This study Ex. 1: copper	This study Ex. 2: iron
NA	--	3.4		0.038	0.008
AA	--	8.9		0.026	0.007
NA	+ soil	21	11.5	0.090[a, x]	0.024[a, x]
AA	+ soil	86	57.5	0.103[b, x]	0.055[b, x]
--	Soil only	n.d.	n.d.	0.004[c]	0.003[c]
Theoretical calculation: Sum of P in 5 g soil + 0.1 g ash					
NA				0.042[y]	0.011[y]
AA				0.030[y]	0.010[y]

NA = non-Agnihotra ash, AA = Agnihotra ash; Ex. = experiment
Different letters denote significant differences at $p < 0.05$ (a, b, c: differences between ash treatments and soil only, tested by Scheffé-test; x,y: difference between soil-ash mixture and theoretical calculation, t-test).

lower than reported by Lai (Table 2, experiments 1 and 2). The addition of Agnihotra ash (AA) resulted in a significantly higher amount of water extractable soil P than the addition of non-Agnihotra ash (NA) in both experiments, however, the differences between AA and NA were much smaller than in the "Lai experiment". While the addition of non-Agnihotra ash (NA, Ex. 2) produced in an iron vessel generated roughly half as much water extractable soil P as the Agnihotra ash (AA, Ex. 2), water extractable soil P in the treatment with NA produced in a copper pyramid (Ex. 1) was only about 10 % lower than in the treatment with AA (Ex. 1). Obviously, the use of copper (maybe in combination with the pyramid shape) in the burning process plays an important role for the effect of ashes on soil P solubility. This assumption is strengthened by the fact that copper content of AA 2 produced in a copper pyramid was by a factor of about 59 higher than that of NA 2 produced in an iron vessel. When the NA was produced in a copper vessel as well (Exp. 1, NA 1), however, its copper content was still lower than that of the corresponding AA (Exp. 1, AA 1), but this time only by a factor of 12 (see Table 1).

The analysis of water extractable P in the test soil without any ash treatment ("soil only") demonstrates that both, Agnihotra as well as non-Agnihotra ash, had a positive effect on soil P solubility: Water extractable P was at least 10 times lower in the untreated soil than in the soil treated with ash (Table 2). In order to check if the increase in water extractable P was solely the effect of the addition of P containing ash, a theoretical calculation was performed (Table 2) which revealed that the amount of P extracted from the soil-ash mixtures (5.1 g) was clearly higher (2 to 5 times) than the sum of extractable P in 5 g soil plus 0.1 g ash in all four cases. Thus it is clear that some other factor, presumably on a kind of subtle energetic level, is responsible for the observed increase.

As shown in Table 3, the results of the 48-hour water extractions could not reliably be reproduced with common extraction methods such as water extraction according to van der Paauw et al. (1971) and CAL-extraction according to Schüller (1969). In experiment 3 - 1, where the non-Agnihotra ash had been produced in a copper pyramid, the soil-ash mixture had significantly lower amounts of extractable soil P than could be expected from the theoretical calculation (sum of P from soil and ash as single components). In fact, the amount of extractable soil P in the soil-ash mixture was even lower than that in the pure ash solution. Obviously, the soil had adsorbed some of the soluble P brought into the mix by the ashes. From a holistic point of view it could be argued that the critical difference between the extraction applied by Lai and the common extraction methods tested here is the time of shaking the soil-ash-water mixture. In the "Lai experiment", this mixture is shaken for 48 hours, whereas the instructions by van der Paauw et al. (1971) and Schüller (1969) allot only 1 or 2 hours, respectively, for shaking. Thus, there may not be enough time for the subtle energies supposed to be at work here to unfold their effects. However, this is not completely true in the case of the water extraction according to van der Paauw et al. (1971), as the soil-ash mixture is left standing with 2 ml deionised water for 22h before filling it up with 70 ml deionised water and shaking.

Interestingly, in experiment 3 - 2, where the non-Agnihotra ash had been produced in an iron vessel, the results were less distinct: Whereas in the case of Agnihotra ash,

Table 3:
P solubility in experiment 3 (mean values of 3 replicates)

		Extractable P (P-W: mg P/0.03 g ash or mg P/1.53 g soil-ash mixture; P-CAL: mg P/0.1 g ash or mg P/5.1 g soil-ash mixture)			
Ash type	Soil yes/no	P-W		P-CAL	
		Ex. 3 - 1: copper	Ex. 3 - 2: iron	Ex. 3 - 1: copper	Ex. 3 - 2: iron
NA	--	0.074	0.016	0.920	0.448
AA	--	0.072	0.026	0.883	0.602
NA	+ soil	$0.059^{a, x}$	$0.027^{a, x}$	$0.666^{a, x}$	$0.529^{a, x}$
AA	+ soil	$0.060^{a, x}$	$0.049^{b, x}$	$0.674^{a, x}$	$0.729^{b, x}$
--	Soil only	0.003^{b}	0.008^{c}	0.049^{b}	0.084^{c}
Theoretical calculation: Sum of P in 1.5 g soil + 0.03g ash / 5 g soil + 0.1 g ash					
NA		0.077^{y}	0.024^{y}	0.968^{y}	0.532^{x}
AA		0.075^{y}	0.034^{y}	0.932^{y}	0.686^{y}

W = water according to van der Paauw et al. (1971), CAL = calcium acetate-lactate according to Schüller (1969); NA = non-Agnihotra ash, AA = Agnihotra ash; Ex. = experiment. Different letters denote significant differences at $p < 0.05$ (a, b, c: differences between ash treatments and soil only, tested by Scheffé-test; x,y: difference between soil-ash mixture and theoretical calculation, t-test).

the soil-ash mixture did show a significantly higher amount of extractable soil P than expected from the theoretical calculation, the non-Agnihotra ash-soil mixture displayed no or only a very slight increase in P solubility (Table 3). While the use of the iron vessel for the production of non-Agnihotra ash may be an explanation for the fact that the Agnihotra ash performed better than the non-Agnihotra ash in experiment 3 - 2, so far no reason can be found for the different performance of Agnihotra ash in experiments 3 - 1 and 3 - 2.

6 Conclusions

From the results presented here, the potential of Homa farming and Agnihotra ash in particular to improve the solubility and thus the plant availability of soil P is clearly visible. However, a number of questions remain to be solved. As was shown in the experiments, the use of copper vessels for burning appears to play an important role in the effectiveness of the fire technique. Further experiments with vessels of different shape and material would be necessary to clarify the exact function of the different components in the Homa technique. Another open question is the role of time for the development of the subtle energetic processes which are postulated to be at work here from a holistic point of view. Future lab experiments should investigate the influence of contact time between soil, ash and water / extractant on the amounts of soil P extracted from the mixtures.

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