

3rd International Congress Wastewater in Small Communities towards
the Water Framework Directive (WFD) and the Development Goals (MDG)

A PRELIMINARY SURVEY OF THE PUBLIC ACCEPTANCE OF THE USE OF HUMAN URINE AS FERTILIZER IN TURKEY

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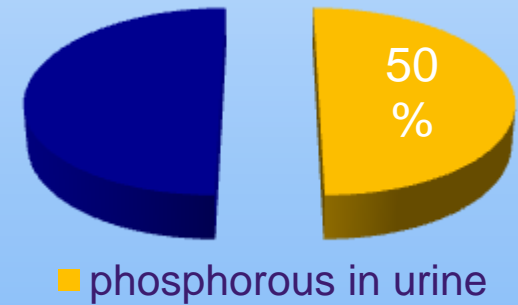
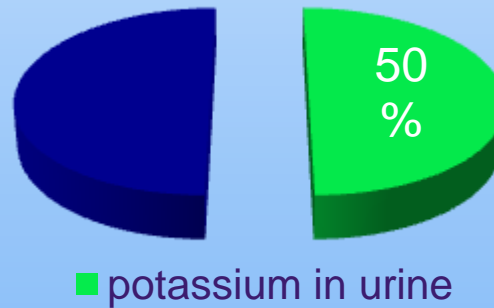
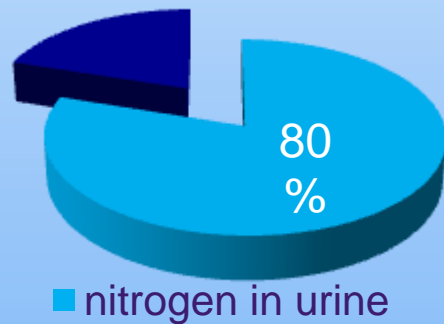
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ECOSAN (ECOLOGICAL SANITATION)

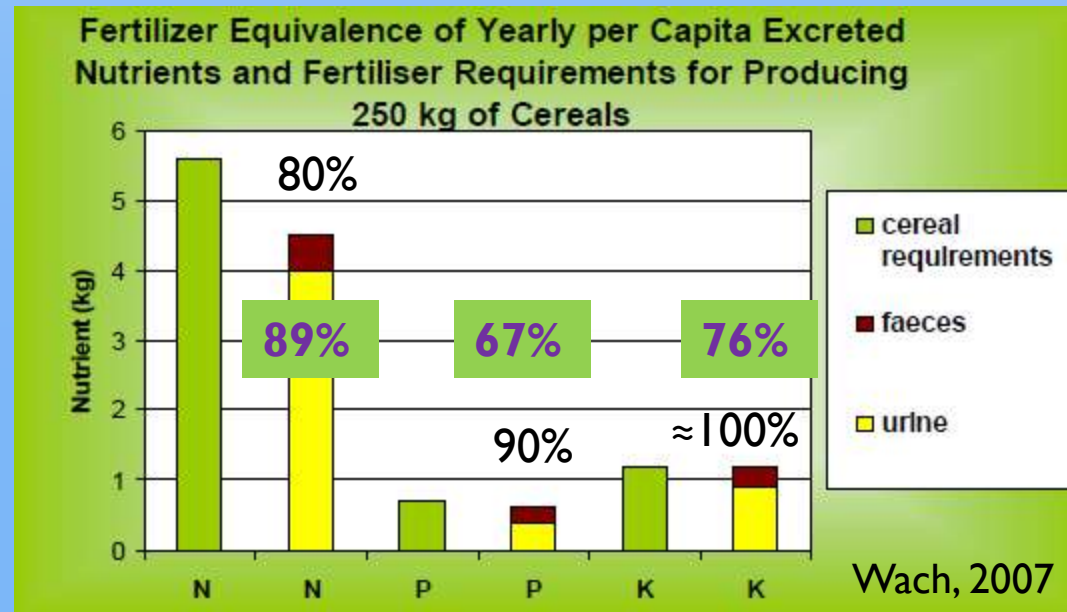
- Domestic wastewater is not a waste to be discarded but a source to be reevaluated
- The new concept recommends separate collection of domestic wastewater fractions at the source and their further use as appropriate
- One of those fractions is yellow water, i.e. source separated human urine

YELLOW WATER

- contains the largest portion of nutrients by far



- final use of yellow water as fertilizer



YELLOW WATER

- The great majority of pathogens remain in feces however, a small number may also be associated with urine
- A storage period of up to six months is recommended for bacteriological safety before application onto soil
(Hoglund et al., 2002; WHO, 2006)
- Urea which is the predominant form of nitrogen in fresh urine is converted into ammonical nitrogen during storage
(Udert 2003; Beler Baykal & Bayram, 2007; Beler Baykal et al., 2010)
- The fate of hormones and pharmaceuticals in urine are yet to be investigated

YELLOW WATER AS FERTILIZER

- Human urine may be applied onto plants through **direct** or **indirect** routes
- When applied directly, all constituents in urine are bound to come to contact with plants
- If direct application is selected, dilution should be exercised prior to application which will reduce the negative impact due to salinity
- Indirect application follows some kind of processing
- Indirect application considers concentration of nutrients specifically in a new phase which will be separated out from urine thereby leaving the undesirable components in the original urine solution

INDIRECT USE OF URINE

Methods like struvite precipitation, freeze-thawing and ion exchange

- Struvite precipitation was reported to be especially effective for phosphorous recovery with a minimum of 90%
(Harada et al., 2006; Kabdasli et al., 2006)
- Ganrot et al. (2007, 2008) applied urine as fertilizer after freezing-thawing and struvite precipitation and/or adsorption to zeolite and reported 97% phosphorous and 90% nitrogen recovery

INDIRECT USE OF URINE

- Beler Baykal et al. (2004, 2009) used ion exchange with clinoptilolite for transferring the ammonium and potassium from stored urine onto the solid phase and achieved 97% ammonium and 99% potassium removal
- Total recovery of ammonium from exhausted clinoptilolite under conditions mimicking irrigation was reported as 88%

(Beler Baykal et al., 2010)

PUBLIC ACCEPTANCE

- A survey undertaken in Switzerland had shown that farmers accepted the use of urine as fertilizer as a good/very good idea with 57% and bad idea with 33% for 125 participating farmers
(Lienert et al., 2003)
- In other Swiss survey, 72% of consumers thought they would eat vegetables fertilized with urine, and 80% of participants had a preference for vegetables fertilized with urine over artificial fertilizer
(Pahl-Wosti et al., 2003)

However, participants indicated concerns about micropollutants, hygienic aspects, residues such as hormones and pharmaceuticals

AIM & SCOPE

to make a preliminary survey in attempt to assess the attitude a group of Turkish people towards approval and willingness to use plants fertilized with direct and indirect use of human urine

participating individuals, who were residents of Istanbul, were asked for their opinion to enable comparisons between natural fertilizers versus artificial fertilizers;

acceptance of urine as fertilizer versus willingness to consume those plants;

direct use versus indirect use; and

acceptance of application on three different groups of plants

METHODS

Questionnaire was used as method

- The questionnaire was aimed at finding out public attitude towards the utilization of urine as fertilizer for agricultural or landscape purposes
- About 100 people were asked to fill in the questionnaire.
 - 51% were males with an average age of 34 and
 - 49% were females with an average age of 35.

METHODS

In addition to personal data like age, gender, education, occupation, residence etc., the participants were asked to share their ideas regarding

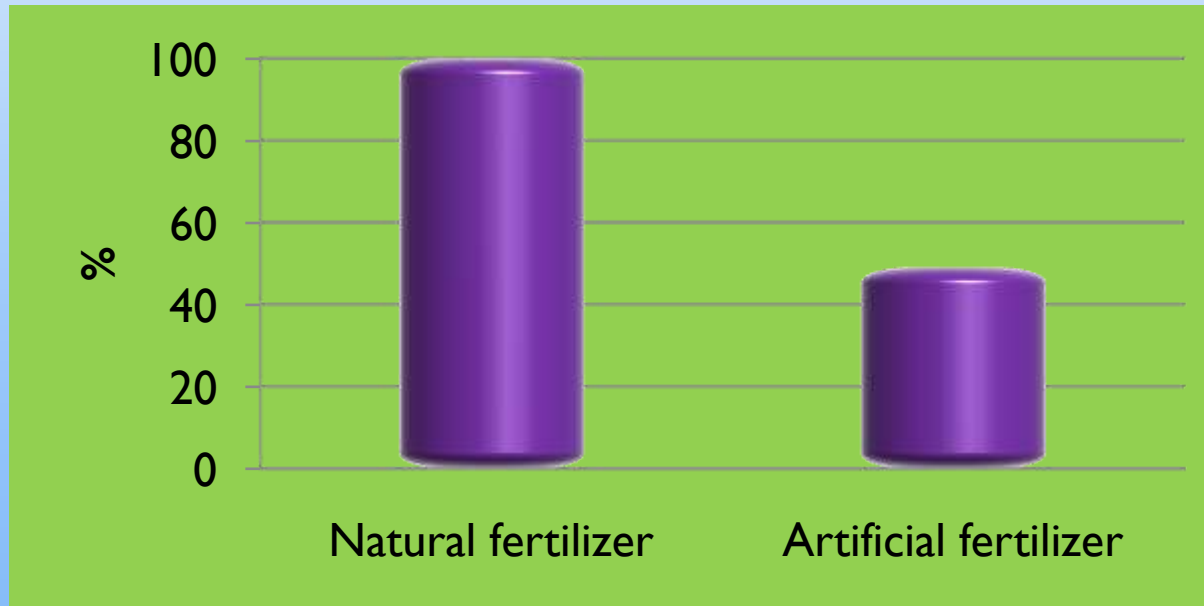
- Acceptance of fertilizers in agriculture (natural or artificial)
- Approval of using urine directly as fertilizer for specified products
- Willingness to consume specified products that were fertilized directly with urine
- Approval of using processed urine as fertilizer for specified products (i.e. indirect use)
- Willingness to consume specified products that were fertilized with processed urine (i.e. indirect use)

Three groups of plants were questioned: landscape plants, plants eaten raw, and plants eaten cooked.

RESULTS

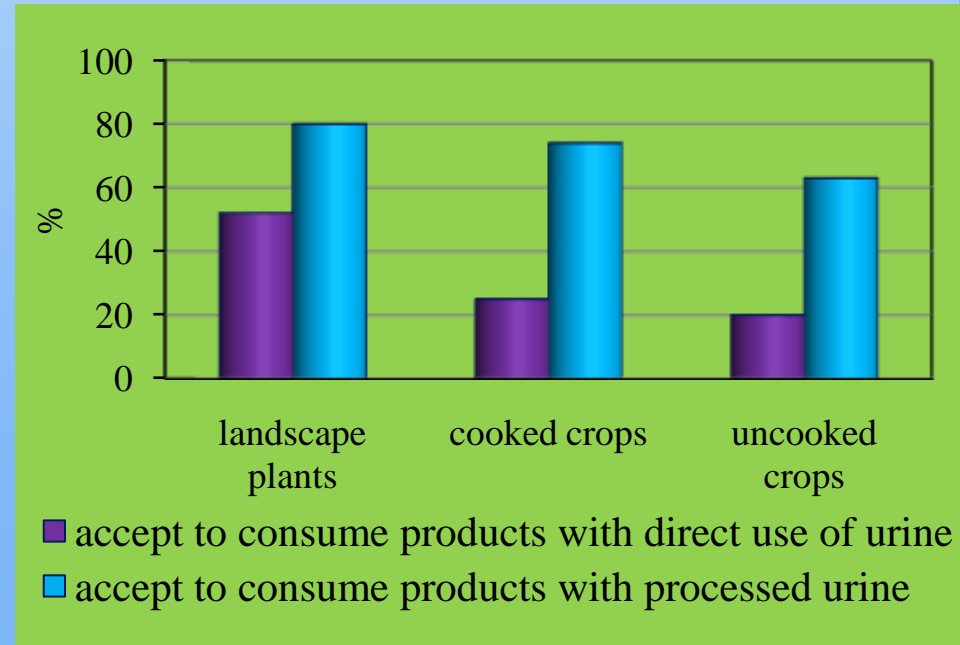
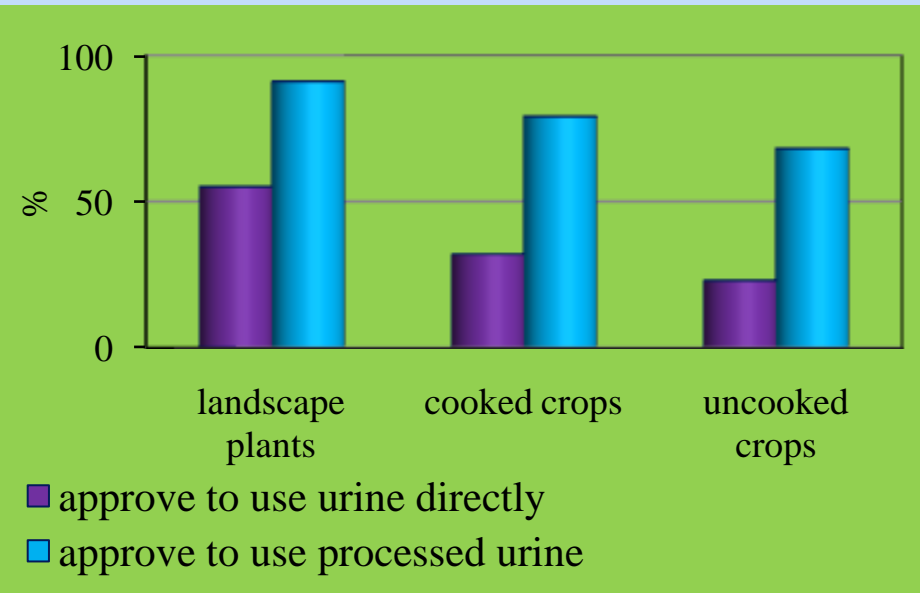
A horizontal bar spanning the width of the slide, divided into four colored segments: dark blue, light blue, green, and orange.

RESULTS



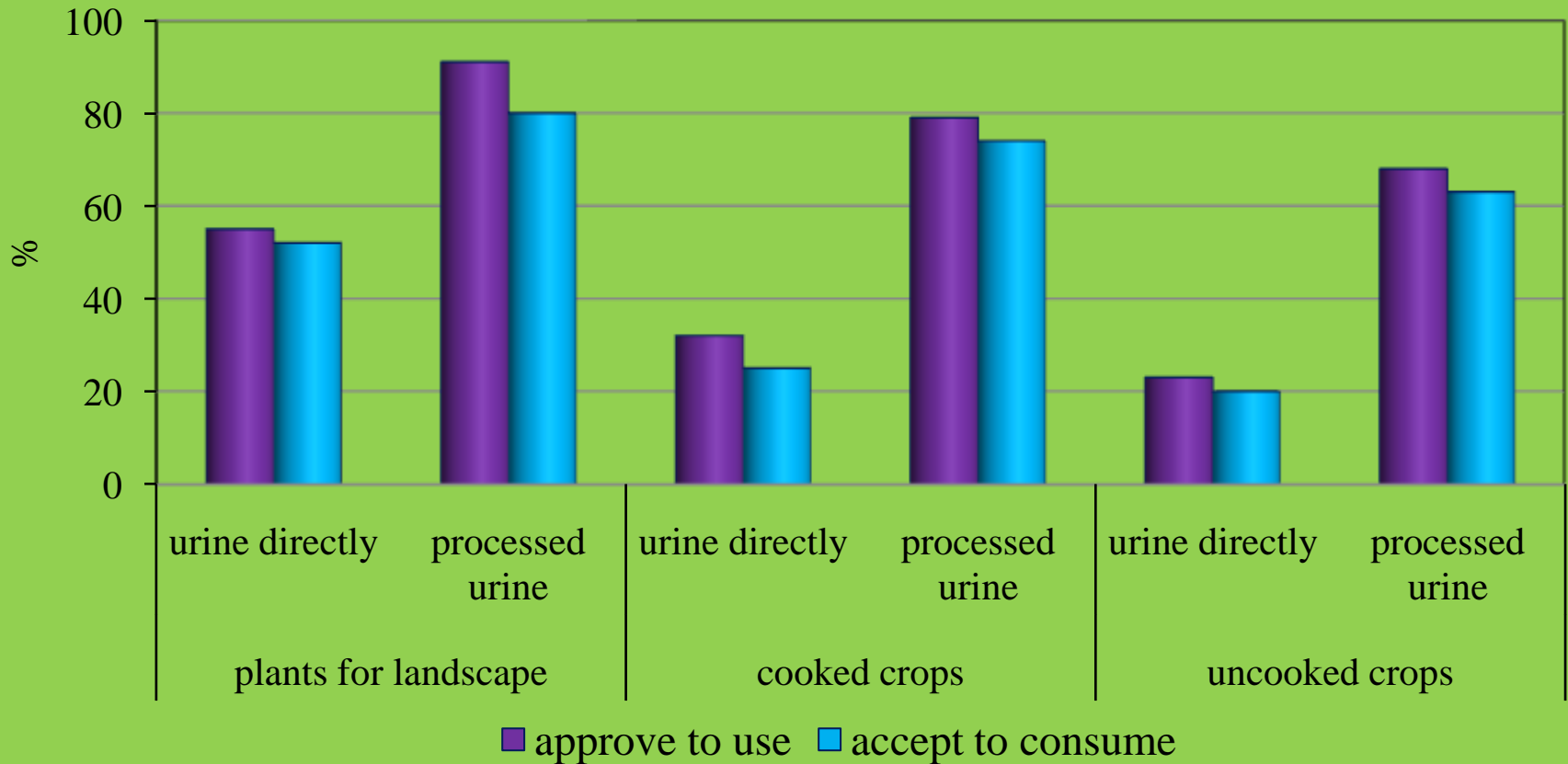
Accept to use of natural and artificial fertilizer

RESULTS



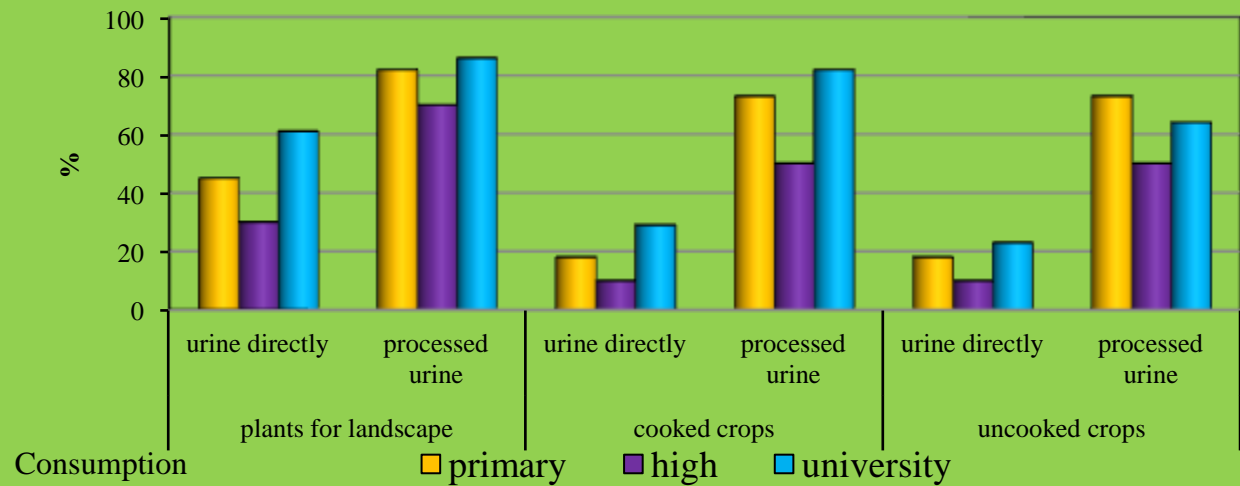
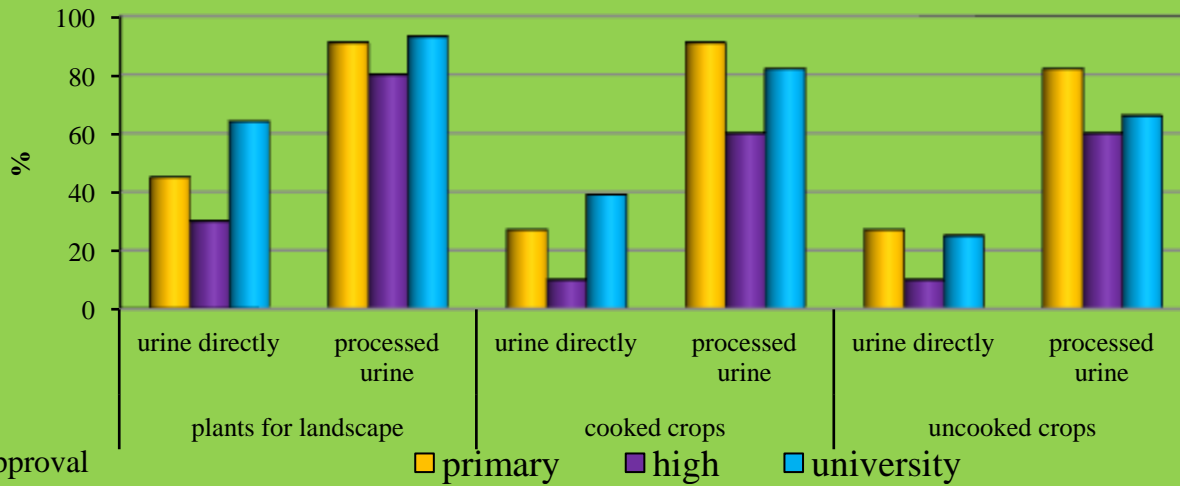
Attitude of participating individuals towards the use of human urine as fertilizer

RESULTS



A comparison of the approval of the use and willingness for self consumption

RESULTS



RESULTS

- The participants who indicated concern were uncomfortable about the idea of using urine and had uncertainties about the reliability of utilization.
- The main reasons of concern were the human health aspects, especially pathogens, and the safe use of urine as a fertilizer.
- In all age groups or educational levels the concerns were similar. No major differences were observed with gender.

CONCLUSIONS

- Attitude of consumers towards the use of different types of fertilizers and the possible use of source separated human urine is one of the priority determinants for their large scale and widespread application.
- The results based on the response of participating individuals of the preliminary survey had revealed that the acceptance for natural fertilizers was 100% while only about half thought artificial fertilizers are acceptable.
- There was a considerably higher acceptance for indirect use of human urine as fertilizer after some kind of processing.

CONCLUSIONS

- Landscape plants received a much higher acceptance as compared to food stuff to be eaten by consumers.
- The use of human urine was more acceptable for plants eaten cooked as compared to those eaten raw.
- Self consumption of plants fertilized with human urine received a relatively lower acceptance than approval of the use of fertilizers from urine.

CONCLUSIONS

- Positive results to be obtained from further research on the fate of human urine as fertilizer will probably lead to the reevaluation of this “resource” and bring it closer to the acceptance of natural fertilizer which is basically animal excreta.



THANK YOU...

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