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EFFECT OF POTASH ALUM (ALLUMINIUM POTASSIUM SULPHATE) ON HUMAN SEMEN AND SPERM

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Abstract: 25 normal and healthy human volunteers were engaged in this investigation. The different concentration of potash alum solution have different effects on sperm, motility/death and fructose level of the semen. Higher concentration have higher effects.

Key words: alluminium potassium spermicides semen

INTRODUCTION

Spermicides, acting as vaginal contraceptives, make sperms less motile or kill and chemically immobilize or destroy. In many parts of the world homemade vaginal contraceptives are being used as simple, cheap and harmless spermicides. The development of chemical spermicides for public use dates back to the 1930's. Blackshaw and Emmens (1, 2) have reported that spermicidal effects are due to change in the concentration of the inorganic salts present in the medium. Gamble (3) reported sodium chloride in the form of salt jelly as intravaginal contraceptive.

Mann (4) classified spermiostatic or spermicidal compounds under four groups: electrolytes, enzyme inhibitors, sulphydryl binding substances and surface active substances.

Mann et al (5) reported about the presence of fructose in human semen as an essential component for spermatozoal motility and metabolism. Martin (6) has also reported that organic acids (lactate, citrate and aconitate) are the primary carriers of Al^{+} within the cytoplasm as these suppress $Al(OH)^{0}_{3}$ precipitation and due to their low molecular weight nature, permit relatively free movement within the cell.

Potash alum is commonly known as "Phitkiri" and chemically known as "Alluminium potassium sulphate."

With the purpose to assess the spermicidal effects of chemicals, the potash alum was selected and *in vitro* investigation on human semen ejaculates was performed.

METHODS

Semen ejaculates of twenty five (25) healthy volunteers, in 25–30 years age group, were collected by self masturbation into a clean wide mouthed glass tube. The semen ejaculates were collected with an

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abstinence of minimum five days. Semen samples with normospermic (6) condition were left for 30 min at room temperature for liquefaction (7).

Three different concentrations, i.e 15%, 10% and 5% were prepared by dissolving potash alum into glass distilled water (g.d.w.). Spermicidal effects was observed by the method of Sander and Cramer (8). 0.5 ml of liquified semen was mixed with 0.5 ml of different concentration of potash alum separately. Semen without potash alum solution was considered as control sample. After thorough mixing the samples were observed continuously under high power of microscope to assess the motility of sperm. The time of complete immotility of total sperms was noted. Fructose was estimated by the method of Mann (9). The complete immotility time and fructose concentration due to the effect of potash alum was finally calculated and shown as mean ± standard error. The significance was calculated by Student's t–test.

RESULTS

The result have been shown in Table I. As per result the viability and motility of sperms vary with different concentration of potash alum. In case of 15% concentration the death time was 51.9% sec in case of 10% it was 87.2 sec and in case of 5% it was 122.1 sec. The concentration of potash alum in comparison to control.

TABLE I : Effect of potash alum on viability of sperms.

S.No.	*Status of semen*	*Percentage of spermicide added into semen*	*Amount of spermicides (in ml)*	*Amount of semen (in ml)*	*Time required for complete immotility of sperms (in sec) Mean±S.E.*	*P. value*
1.	Cont (a)	–	0.5(G.D.W.)	0.5	3626.9 ± 0.39	ab***
2.	Exp (b)	15%	0.5	0.5	51.9 – 0.02	ac***
3.	Exp (c)	10%	0.5	0.5	87.2 ± 0.67	ad***
4.	Exp (d)	5%	0.5	0.5	122.1 ± 0.15	

Cont – control; Exp – experimental
Significance: P value – +++ – H.S. (P>0.001)

TABLE II : Effect of potash alum on the concentration of fructose in human semen.

S.No.	*Status of semen*	*Percentage of potash alum added into semen*	*Concentration of fructose (mg/100 ml) Mean±S.E.*	*P. value*
1.	Cont (a)	—	137.94 ± 4.30 (5)	ab***
2.	Exp (b)	15%	14.86 ± 0.79 (5)	ac***
3.	Exp (c)	10%	23.02 ± 0.43 (5)	ad***
4.	Exp (d)	5%	26.83 ± 2.66 (5)	

Cont – control; Exp – experimental
Significance: P value – +++ – H.S. (P>0.001)

As per result shown in Table II the decrease in fructose level of semen due to different concentration of potash alum is significantly high in comparison to control.

DISCUSSION

Our findings clearly indicate that increases in concentration of potash alum decrease the death time/complete immotility time of sperms accordingly (Fig. 1).

The highly effective action of potash alum might be due to its dissociation into Alluminium, potassium and sulphate ions i.e. Al^+, K^+ and SO^-_4. Al^+ and K^+ behave as cation and SO^-_4 behaves as anion. The cation and anion are responsible for spermicidal actions. The present results can be correlated with the findings of Peterson and Freund (10) who reported that cation like Alluminium and potassium are spermicidal in action. Parker and Nordstrom (11, 12) have also reported that Alluminium exhibits a complex speciation chemistry which is highly dependent on pH and the presence of complexing ligends and is known to precipitate at pH values greater than 4.5. Furthermore, Narayan and Singh (13) have also reported that anion act as spermicides. In present investigation due to the presence of two cation (Al^+ and K^+) and one anion (SO^-_4), the metabolism of sperms might have been inhibited and sperms would have become immotile very quickly. This can be ascertained with the increase in potash alum concentration which decreases the time of complete immotility accordingly. The

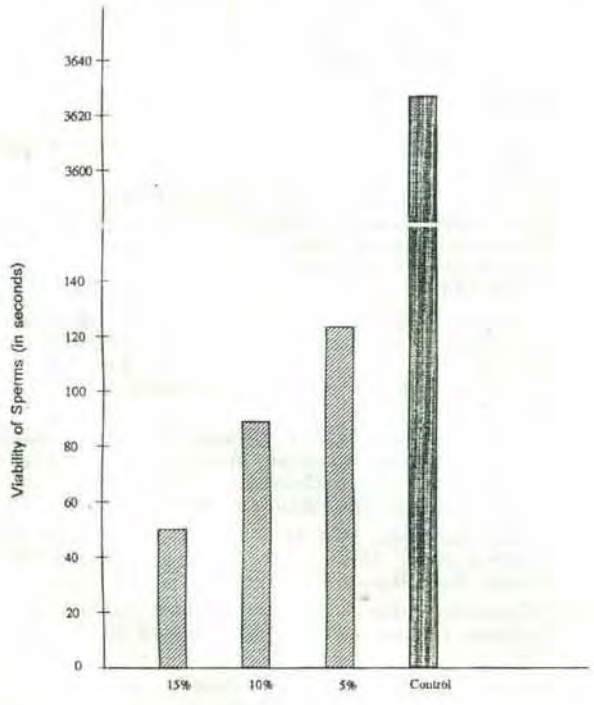

Fig. 1 : Showing the effect of potash alum on viability of sperms.

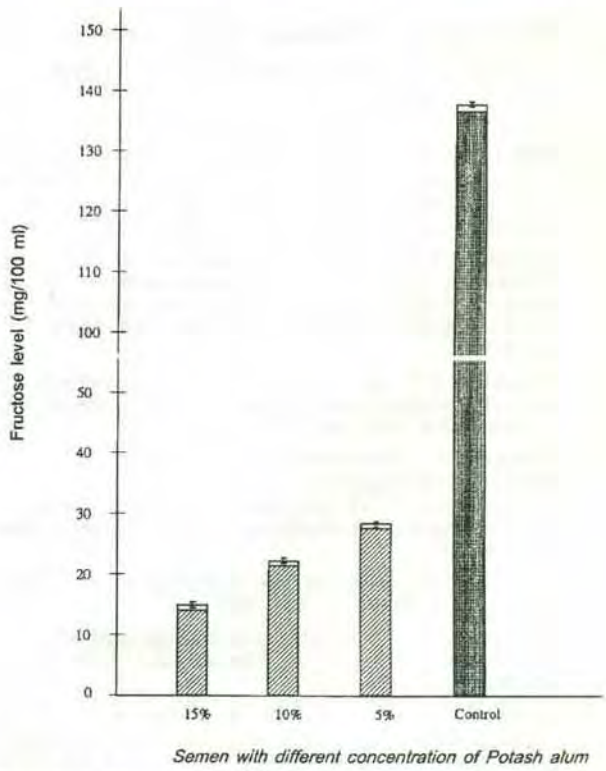

Fig. 2 : Effect of potash alum on fructose of human semen.

action of anions (sulphate, nitrates etc) may be different due to the difference in their molecular size which facilitates their entry to the site of bonds (ionic) present particularly within the proteins (tertiary) or between the protein (quarternary) of plasma membrane of sperms.

The metabolic inhibition of sperms by potash alum can be correlated with the findings of Mann (5) who reported complete inhibition by 5% sodium chloride. It has been well reported that cation and anion are essentially needed for several enzyme systems. Jones and Kochian (14) have reported that the toxic mode of Al^{+} is not through an interaction with enzymatic catalytic metal binding sites but may be through the interaction with specific membrane lipids.

Similarly during the process of fructolysis enzyme systems need cations and anions. In our investigations, it might have happened that the addition of potash alum solution into semen have aggravated the enzymes responsible for fructolysis and this is quite clear from the observed fructose concentration in semen with different grades of potash alum in solution.

The decrease in fructose level responsible for lessened viability and motility of sperms (15) can be correlated with our findings as reported in Table I, showing decrease in motility and viability due to increase in potash alum concentration.

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