

TRIALS FOR INCREASING KEEPING QUALITY OF EGYPTIAN MINCED MEAT "KOFTA" AND "KAPAB" BY SPICES EXTRACTS

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INTRODUCTION

Egyptian minced meat "Kofta" and "Kapab" are a popular meat products of either beef or lamb, served in various food restaurants in Egypt. In general, Kofta is prepared from minced lean beef, mixed with fat "beef pre-nephric or tail sheep fat", common salts and additives such as spices, vegetables. After thorough mixing being grilled in the form of fingers "Kofta", El-Khateib et al. 1985, 1986. Kapab is prepared as slices of mutton or beef (rich in fat content), these slices mixed with common salts and spices for at least 6 h. before grilling.

The microflora of Kofta varies greatly Presumably reflecting the situation during processing and the storage temperature The presence of more meat juice and the distribution of the surface microbes throughout the meat during mincing enhances the viability and growth rate of the organisms, Wyatt and Guy, 1980. Flesh of an animal (used in the manufacture

of Kapab) are considered sterile. Once the animal is slaughtered, bacterial contamination usually occurs and spoilage is expected. This is of major concern to the meat industry.

Kofta and Kapab may at times constitute a public health hazard, as a result of holding these products, at room temperature for long time for sale. The storage temperature is suitable for growth and multiplication of microbial flora and products. In this regard it is generally accepted that many herbs and spices are known to exhibit antimicrobial activity and influence the keeping quality of foods to which they have been added. The preservative action of herbs and spices in addition to widely used to improve flavour to meat products has only recently received attention in the literature where studies, (Sharman et al. 1979, Hittoko et al. 1980, El-Khateib et al. 1984, (1985b) 1986, El-Khateib and Abd El-Rahman 1987, El-Khateib et al. 1988), have been reported and showed that bacteria and mycotoxin producing fungi may be inhibited by some herbs and spices.

Little is to be found in the literature on effects of spices extract on the microflora of Kofta and Kapab. The present study was undertaken to determine the effect of garlic, clove, cinnamon and onion extracts on growth patterns of the normal microflora of Kofta and Kapab.

MATERIALS AND METHODS

SPICES EXTRACTS

Four spices were chosen for this study on the basis of their reported antimicrobial activity or from the results obtained from preliminary studies. The spices used were as follows: garlic (*Allium sativum* L.in), cinnamon (*Cinnamom cassia*) clove (*Eugenia caryophyllus*) and onion (*Allium cepa*). The extracts were prepared as: The garlic and onion (500 g each) were blended in a blender, squeeze through a cotton muslein. The extracts were filter, and completed to 50 ml with water. Clove and cinnamon (200 g each) were extracted by decoction method for 8 hr. in a water bath. Filter, through filter paper..

TESTED ORGANISMS

The organisms used in this were (*Salmonella typhimurium* S453 ; *Staphylococcus aureus* St 35 and enteropathogenic *E. coli* E75) obtained from Federal Centre for Meat Research, 8650 Kulmbach, FRG. *Pseudomonas aeruginosa*, *Proteus vulgaris* and *Sarcinia lutea* were stocked in Food Hygiene Dept. Faculty of Veterinary Medicine, Assiut University, Assiut/Egypt. The cultures were maintained on slants of nutrient agar (Merck) at 37 C.

DETERMINATION OF THE MINIMUM INHIBITORY CONCENTRATIONS (MIC, s).

The (MIC, s) of garlic, clove, cinnamon and onion extracts against the previously mentioned bacteria were evaluated using the agar-cup diffusion technique, Garrod and O'Grady, 1972. The agar was melted, seeded with the organism under test to give a final concentration 10^5 - 10^6 organ-

ism/ml. Then poured in sterile Petri dishes (15 cm diameter). After allowing the agar to solidify, cups were prepared 10mm diameter using a sterilized cork borer. The various dilutions of each extract (20%, 10%, 5%, 2.5%, 1.25% and 0.625%) were then added to the cups in appropriate quantities in triplicate. The plates were incubated for 24 h. at 37 C. After incubation, the inhibition zones were measured in mm, and a curve determining the relation between X^2 and logarithm concentration of the extract was constructed and used to estimate the MIC,

$X = \frac{\text{diameter of inhibition zone} - \text{diameter of the cup}}{2}$

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DETERMINATION OF BACTERIOSTATIC AND BACTERICIDAL ACTIVITIES

Various concentrations (20%, 10%, 5%, 2.5%, 1.25% and 0.625%) of different extracts were inoculated by the tested organisms (about 10 organisms/ml) and incubated at 37C for 48h. Subculture were then made from the tubes showing no growth, by transferring a loopful from each dilution into 5ml sterile Brain Heart Infusion (BHI) broth. The results were taken after incubation period of 48h.

MEAT PRODUCTS "KOFTA" AND "KAPAB"

Lot of Kofta was prepared according to El-Khateib et.al. (1985a). Kapab was prepared from beef meat (*Longissimus dorsi*), where it was cut into pieces (4X2X1 cm), mixed with 1% sodium chloride. Both two products were divided into 3 portions, the first is control, the second contain 1%

spices extract (mixtures of garlic clove cinnamon and onion 1:1:1:1 v/v) while the third contain 2% from previously spices extracts (mixtures).

Each portion was divided into three groups, the first stored at 25 C while the second at 15 C and the third at 8 C.

ENUMERATION PROCEDURE

20 g of the products were homogenized in a Waring-Blender with 180 ml of sterile physiological saline to give a 0.1 dilution.

The following tests were conducted on the homogenate:

1-Total aerobic plate count (APC) and Pseudomonas count were carried out according to Leistner et.al, 1981.

2-Enterobacteriaceae count was carried out on Deoxycholate hydrogen sulfide lactose agar (DHL, Merck).

RESULTS AND DISCUSSION

The minimum inhibitory concentration (MIC, s) of the tested extracts on food poisoning and spoilage bacteria are listed in Table 1. The (MIC, s) of garlic, clove and cinnamon extracts on Salmonella typhimurium, Staphylococcus aureus, enteropathogenic E. coli, Pseudomonas aeruginosa, Proteus vulgaris and Sarcinia lutea were (3%, 3%, 3%, 2.5%, 2.2% and 1.5%), (3%, 2.5%, 2.5%, 3.5%, 1.5% and 1.5%) and (5%, 2.5%, 5%, 4%, 3.2% and 2%) respectively. On the other hand (MIC, s) of onion extract on all previously tested bacteria were more than 20% except Proteus vulgaris 2.5%. Testing the bactericidal activity of garlic, clove, cinnamon and onion extracts,

revealed that all these extracts have bactericidal activity. They are only inhibited bacteriostatic effect.

EFFECT OF 1% AND 2% SPICES EXTRACTS ON MICROFLORA OF KOFTA AND KAPAB
For Kofta, prepared with 1% and 2% mixtures from spices extracts (garlic, clove, cinnamon and onion 1:1:1:1 v/v), Fig. 1, the total bacterial count decrease (1.5 and 2.5) log cycle; Enterobacteriaceae count decrease (1 and 2) log cycle and Pseudomonadaceae counts decrease (0.6 and 1) log cycle if it is compared with the control at 25 C after 48 h. respectively. Concerning the growth rate of microflora in Kapab which contained 1% and 2% mixture from previously spices extract and held at 25 C, Fig. 2, it is clear that 2% spices extract caused decrease in the counts of total bacteria, Enterobacteriaceae and Pseudomonadaceae of (0.5, 0.8 and 0.1) log cycle after 48h. respectively.

The total bacterial counts, Enterobacteriaceae counts and Pseudomonadaceae counts of Kofta and Kapab (control) stored at 25 C are presented in Fig. 3 & 4. These microflora increase (1, 1 and 2) and (0.8, 0.7 and 0.9) logs cycles after 48h. respectively. Similarly increase of previously microflora in Kofta and Kapab prepared with 1% mixture spices extracts. While 2% spices extracts causing decrease of these microflora by (0.7, 1 and 0.8) log cycle and (0.5, 0.8 and 0.5) log cycle in Kofta and Kapab after 48h. respectively.

It is evident from the obtained results in Fig. 5 & 6 that the storage temperature

retarded to some extent the growth rate of some microflora in both products (control). The use of 1% spices extracts caused no change in the total bacterial count after 96h. in prepared Kofta, while in case of Kapab the count decrease 0.5 log cycle after 96h. No noticeable change in the count of Enterobacteriaceae in Kofta and decrease 0.8 log cycle in Kapab after 96h. On the other hand Pseudomonadaceae count of both products with 1% spices extracts increase 0.5 log cycle. The aerobic spoilage flora of fresh meat stored at chill temperatures is usually dominated by species of Pseudomonas, Ingram and Dainty 1971; McMeekin 1975. Regarding the effect of 2% spices extracts (mixture) on the total bacterial count, Enterobacteraceae and Pseudomonadaceae in Kofta and Kapab after 96h. at 8°C, it is clear that the count decrease by (1.2 and 0.7) and (1.5, 1.3 and 0.5) log cycle respectively. Since the time of Pasteur, 1958, the antibacterial properties of garlic and onion have been observed and recorded. Hoffman and Evans, 1911, were among the earliest to describe the preservative action of cinnamon and clove. Bachmann, 1916 and 1918; El-Khateib et al 1988, studied the effect of essential oils of spices on growth of several test organisms including food poisoning and spoilage bacteria, Aspergillus and Penicillium species, and concluded that spices used in amounts as employed normally for ordinary foods were insufficient as preservatives. However, when essential oils used cinnamon and clove retarded the growth of food poisoning and spoilage bacteria. According to our

results, these spices extracts had nearly bacteriostatic effect when used as 2% concentration (v/w).

CONCLUSION

From all the data obtained, it can be concluded that garlic and clove extracts had highest antibacterial effect against all tested food-poisoning and spoilage bacteria. It is of interest that combining garlic, clove, cinnamon and onion extracts produced a more pronounced effect in increasing the keeping quality of Kofta and Kapab which held for sale at room temperature in Egypt markets. However, further studies of combined effects of more different spices extracts or oils should be done to evaluate the practical significance.

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Table 1: The minimum inhibitory concentrations (MIC,s) of garlic ,clove,cinnamon and onion rxttracts on some food poisoning and spoilage bacteria.

Microorganisms	Garlic extract %	Clove extract %	Cinnamon extract %	Onion extract %
Salmonella typhimurium	3.0	3.0	5.0	> 20
Staphylococcus aureus	3.0	2.5	2.5	> 20
Enteropathogenic E.coli	3.0	2.5	5.0	> 20
Pseudomonas aeruginosa	2.5	3.5	4.0	> 20
Proteus vulgaris	2.2	1.5	3.2	2.5
Sarcinia lutea	1.5	1.5	2.0	> 20

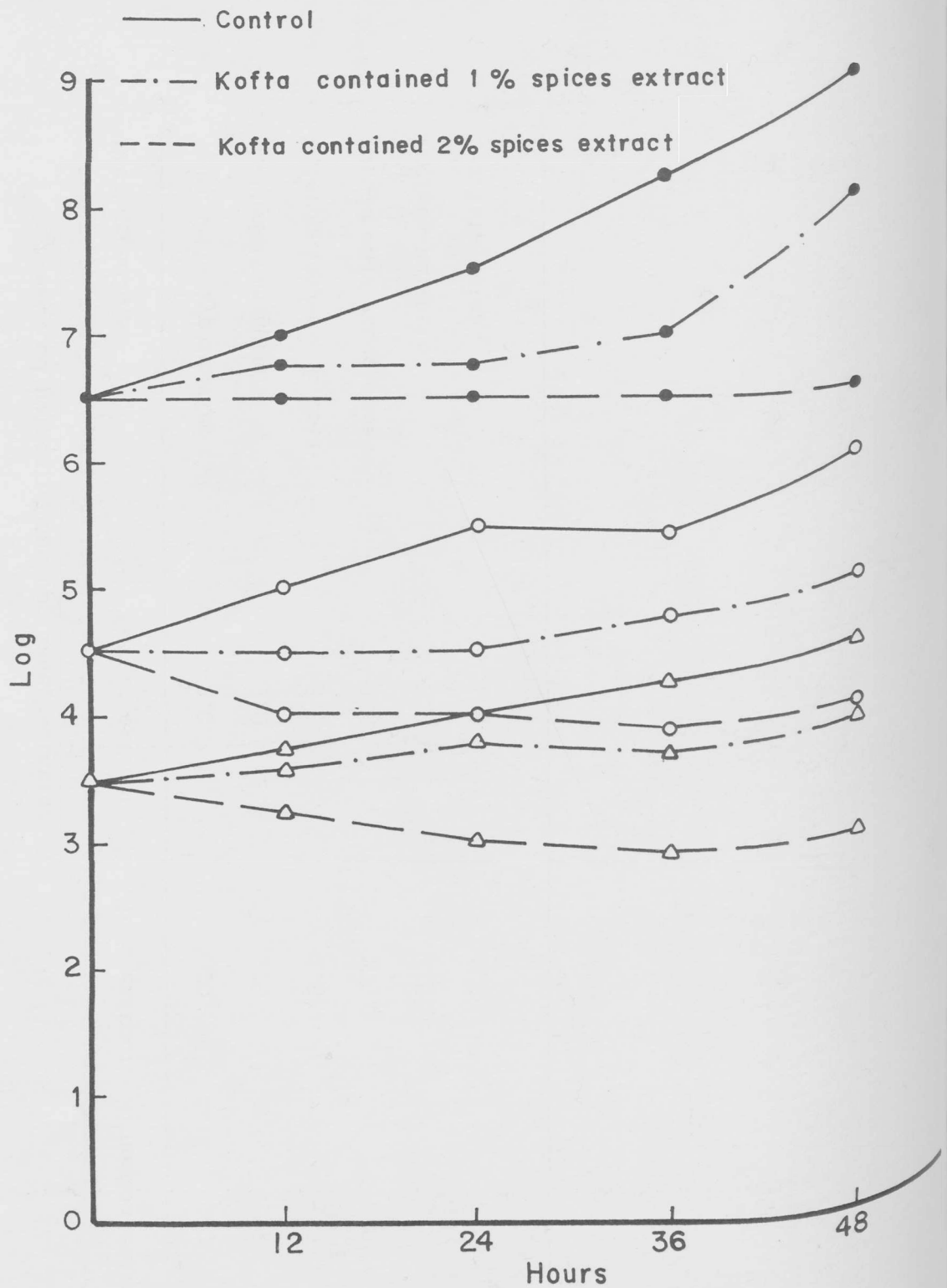


Fig.(1) Effect of 1% and 2% mixtures from garlic, clove, cinnamon and onion extracts (1:1:1:1 v/v) on the microflora of kofta held at 25°C (● Total bacterial count, ○ Enterobacteriaceae and △ Pseudomonadaceae).

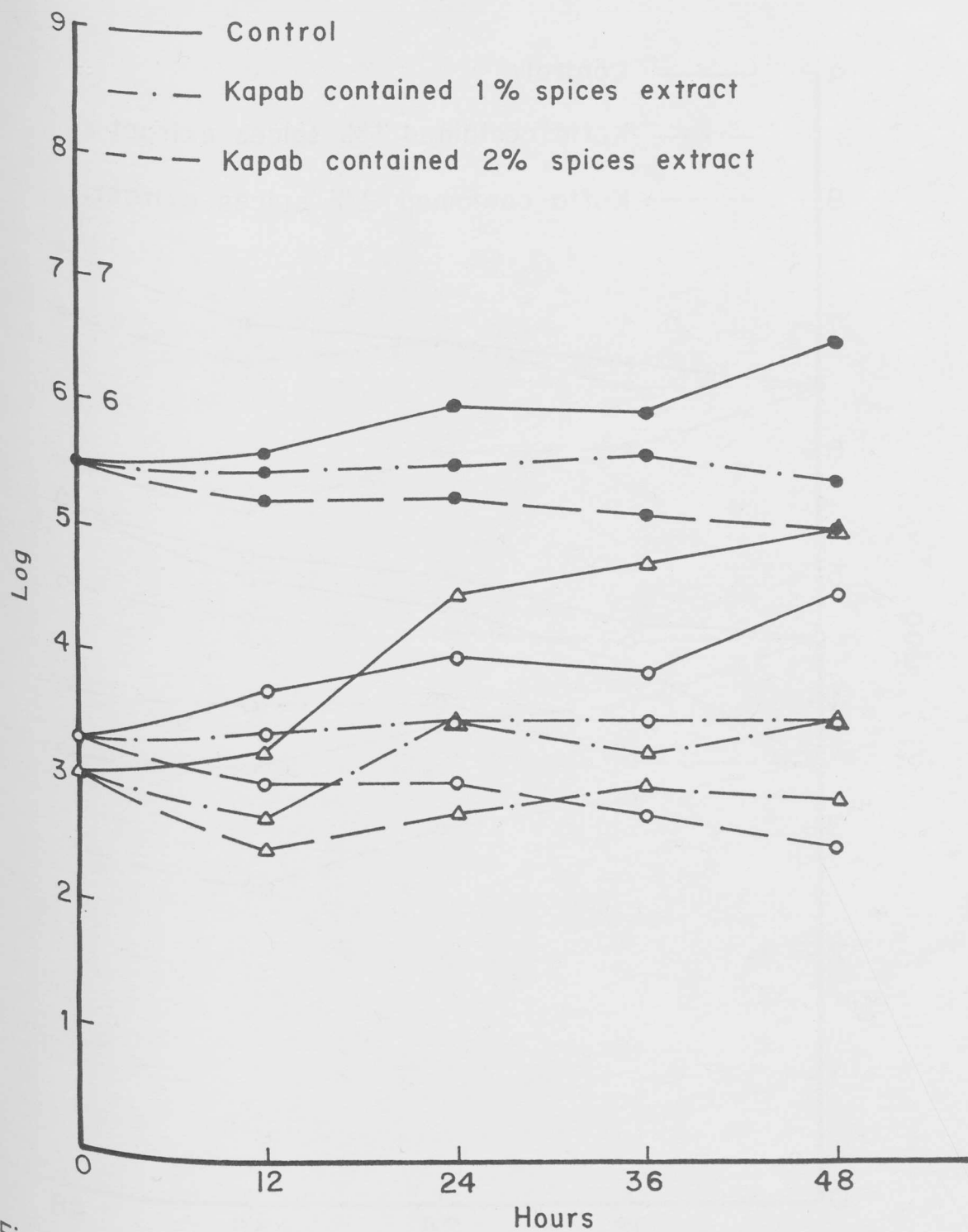


Fig.(2) Effect of 1% and 2% mixtures from garlic, clove cinnamon and onion extracts (1:1:1:1 v/v) on the microflora of kapab held at 25°C (● Total bacterial count, ○ Enterobacteriaceae and Δ Pseudomonadaceae).

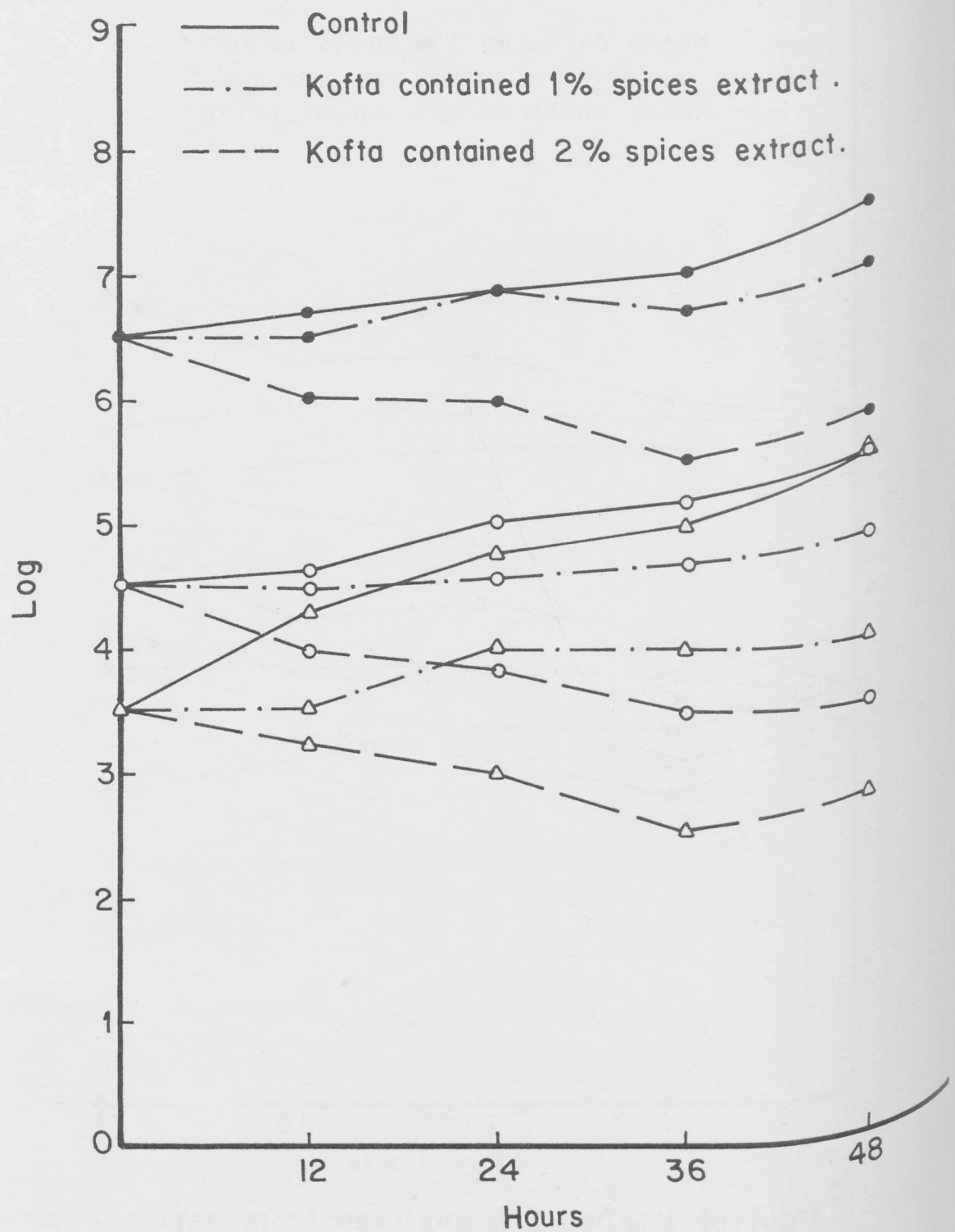


Fig.(3) Effect of 1% and 2% mixtures from garlic, clove, cinnamon and onion extracts (1:1:1:1 v/v) on the microflora of Kofta held at 15°C (● Total bacterial count, ○ Enterobacteriaceae and △ Pseudomonadaceae).

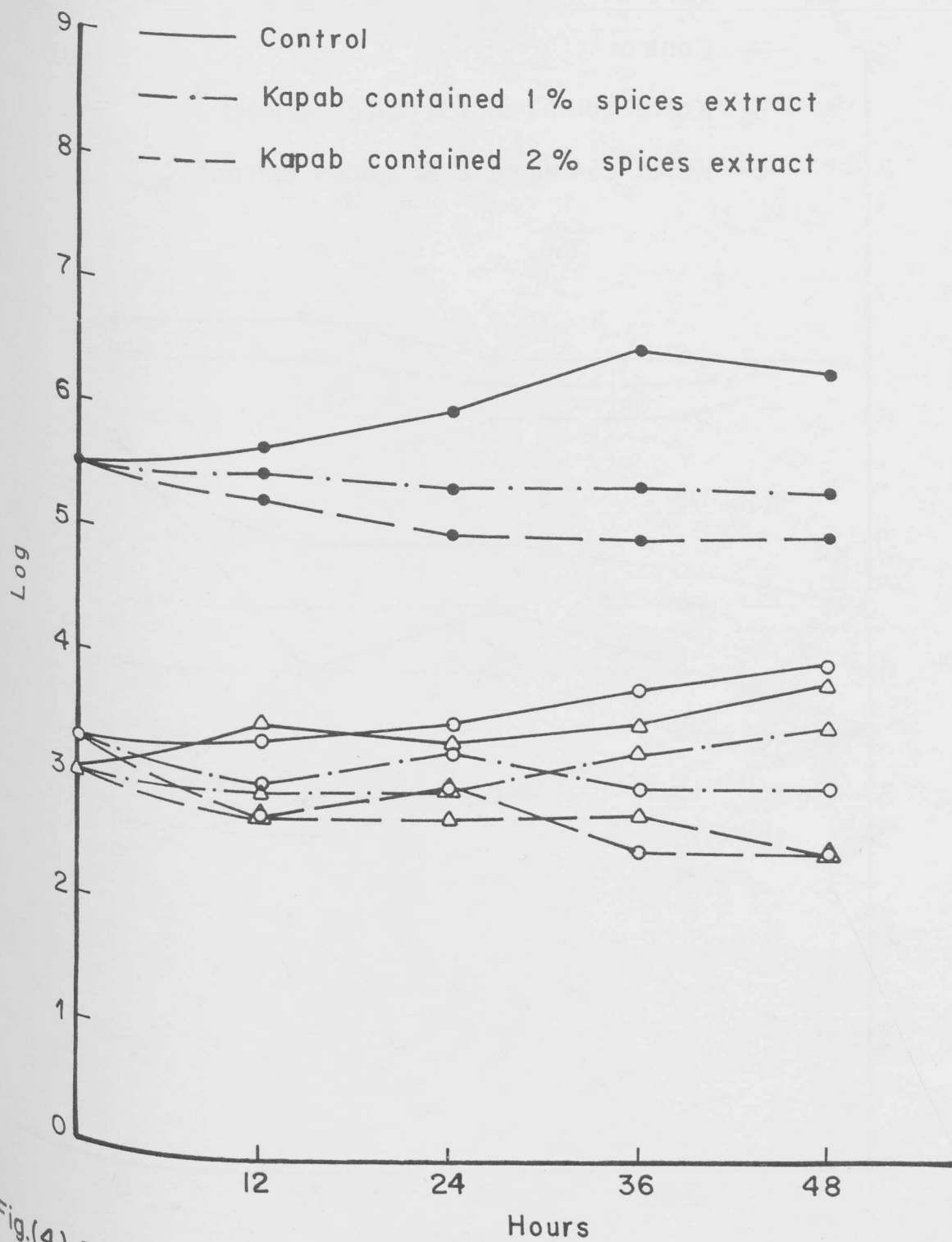


Fig.(4) Effect of 1% and 2% mixtures from garlic, clove, cinnamon and onion extracts (1:1:1:1 v/v) on the microflora of kapab held at 15°C (● Total bacterial count, ○ Enterobacteriaceae and △ Pseudomonadaceae).

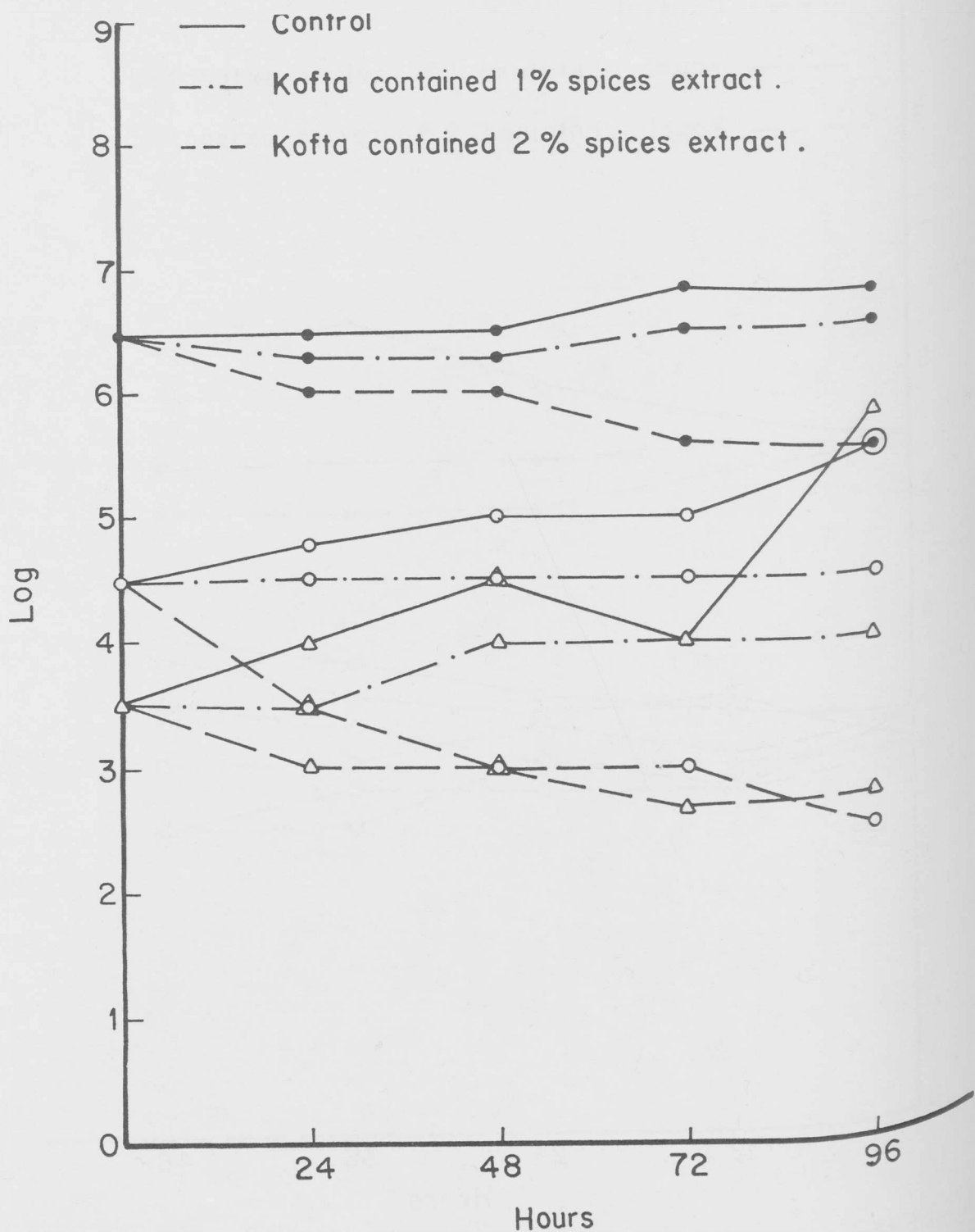


Fig.(5) Effect of 1% and 2 % mixtures from garlic , clove , cinnamon and onion extracts (1:1:1:1 v/v) on the microflora of Kofta held at 8°C (● Total bacterial count , ○ Enterobacteriaceae and △ Pseudomonadaceae) .

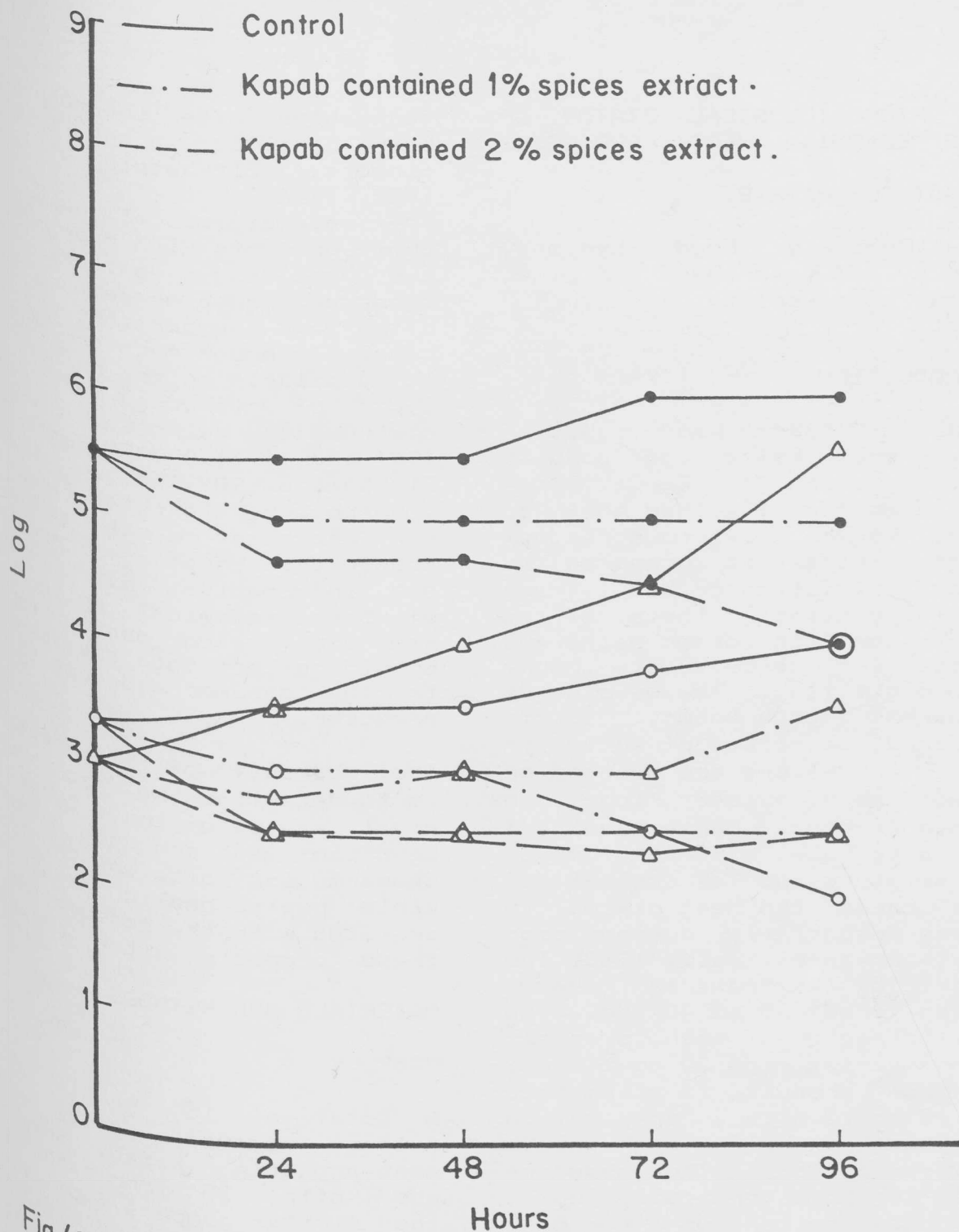


Fig.(6) Effect of 1% and 2% mixtures from garlic, clove , cinnamon and onion extracts (1:1:1:1 v/v) on the microflora of Kapab, held at 8 °C (● Total bacterial count, ○ Enterobacteriaceae and △ Pseudomonadaceae) .