INTRODUCTION
The development and persistence of multi-drug resistance bacteria has posed increasing challenges to public health. In recent years there has been gradual revival of interest concerning the use of medicinal and aromatic plants in developed as well as in developing countries because plant derived drugs have been reported to be safe and without side effects (Pandey and Rai, 2003). Investigations into the antimicrobial mode of action and potential uses of plant volatile oil have regained momentum.

Coriandrum sativum is an annual herb belonging to Apiaceae (Umbellifera) family. It is native to Mediterranean regions and currently cultivated in many countries. Pharmacological studies have shown that coriander has anti-diabetic, hypolipidemic and anti-cancer effects (Collins et al., 1995). Coriandrum sativum has health supporting reputation. It is used for medicinal purposes such as dyspeptic complaints and loss of appetite. The oil is fungicidal and bactericidal (Ayfer and Turgay, 2003). Murraya koenigii – a popular leafy-spice used in Asian – Indian cuisine for its authentic flavor and distinct aroma. It is popularly known as curry leaf and has been stimulated since its high anti-oxidant and anti-carcinogenic potential were reported (Khan et al., 1997, Khanum et al., 2000). It is a rich source of alpha-tocopheral, beta-carotene and lutein. An alkaloid Murrayacine is also found in leaves (Chakraborty et al., 1974). Fresh curry leaves have 2.6% essential oils. Sesquiterpenes, b-caryophylline, b-gurjivene. Sesquiterpenes have antibacterial and anti-fungal activities (Mahantavya and Balasubramaniam, 2003).

Synergistic interaction between the herbs is vital part of therapeutic efficiency. Synergisms between herbs are used in European traditional medical herbalism oriental systems such as traditional Chinese medicine and Ayurveda generally assume synergy to be taking place (Phillipson, 1999). Synergistic interactions are documented from constituents within a total extract of a single herb as well as between herbs in a formulation (Phillipson, 1999).

In the present investigation two common edible plants Coriandrum sativum and Murraya koenigii were screened for their antimicrobial and synergistic activity against some of the MDR strains.

MATERIALS AND METHODS

Plant materials
The leaves of Murraya koenigii and Coriandrum sativum used in this study were collected in and around the regions of Sam Higginbottom Institute of Agriculture technology and sciences. (SHIATS)

Preparation of extract
The leaves of the herbs were air dried and ground to fine powder. The alcoholic extracts of each plant was prepared by adding 20g of powdered material to 100mL of ethanol (70%v/v) in water. The powered material was soaked for 24 h. The extract was filtered by a muslin cloth. The filtrate was taken and evaporated at room temperature. The filtrate after evaporation was diluted with DMSO i.e. Dimethyl Sulphoxide.
Microorganism
The bacterial strains were collected from the “Microbial Culture Collection Bank” of SIATS. The strains were maintained in agar slants. They included: Shigella dysenteriae (MCCB0042), Escherichiae coli (MCCB0038), Salmonella typhi (MCCB0017), Klebsiella pneumoniae (MCCB0019) and Staphylococcus aureus (MCCB0034).

Antibiotic sensitivity test
The antibiotic sensitivity was performed by using agar disc diffusion method as described by (Bauer et al., 1966). The test culture was swabbed with a sterile swab over the agar surface. The antibiotic discs were placed on agar surface with a help of a sterile forcep and kept for incubation at 37°C for 24h. The antibiotic susceptibility was assayed by measuring the diameter of the inhibition zone. The inhibition zone was measured in millimeters. The antibiotics used in the study were Penicillin G (10μg), Cephalosporin (30μg) Amoxicillin (10μg), Cephazolin (30μg), Tetracycline (30μg), Azithromycin (15μg), Clarithromycin (15μg) Clindamycin (2μg), Norfloxacin (10μg) and Vancomycin (10μg).

Antimicrobial activity of plant extracts
The agar well diffusion method was used to screen the antimicrobial activity of plant extracts as described by (Collins et al., 2000; Saeed and Tariq, 2007) which showed that Shigella dysenteriae showed inhibitory effect against both the extracts and their various ratios did not show any inhibitory effect towards Salmonella typhi. Similar results were reported by Jedha et al. (2000) that Coriandrum sativum did not show any antibacterial activity towards Salmonella typhi. Shigella dysenteriae showed inhibitory effect against both the extracts and their ratios. The effect of the individual extracts was less in comparison to the synergism of the extracts. The highest inhibitory effect was found in the ratio of 3:1.

Minimum Inhibitory concentration
The minimum inhibitory concentration (MIC) values were determined by broth dilution method (Madigan et al., 2003)

RESULTS AND DISCUSSION
The antibiotic susceptibility test pattern of organisms are given in Table 1.

As can be seen from Table 2, the extracts of Murraya koenigii and Coriandrum sativum and their various ratios did not show any inhibitory effect towards Salmonella typhi. Similar results were reported by Jedha et al. (2000; Saeed and Tariq, 2007) which showed that Coriandrum sativum did not show any antibacterial activity towards Salmonella typhi. Shigella dysenteriae showed inhibitory effect against both the extracts and their ratios. The effect of the individual extracts was less in comparison to the synergism of the extracts. The highest inhibitory effect was found in the ratio of 3:1.
Escherichiae coli showed sensitivity towards the effect of Murraya koenigii but not against Coriandrum sativum. Cantore et al. (2004) observed that the essential oil of Coriandrum sativum inhibited E.coli. The combination of the extract of Murraya koenigii and Coriandrum sativum showed increased synergistic effect. Ayfer and Turgay (2003) reported that the alcoholic extracts of Coriandrum sativum was not found to show any inhibitory effect on Klebsiella pneumoniae. Apart from the individual extracts the synergism of the two extracts was found highly inhibition on Klebsiella pneumoniae and showed the highest inhibitory effect among all the tested organisms.

Staphlococcus aureus was sensitive both the extracts. Akerela and Ayinde (1998) observed that the volatile oil of Murraya koenigii showed inhibitory effect towards Staphylococcus aureus. Staphylococcus aureus was sensitive Coriandrum sativum but different results were obtained by Ayfer and Turgay (2003) which reported that Coriandrum sativum had no inhibitory effect against Staphylococcus aureus. The synergisms of the two extracts were found to be effective in comparison to individual extracts on Salmonella typhi.

The minimum inhibitory concentration of the different ratios of the extracts of Murraya koenigii and Coriandrum sativum are given in Table 3. Broth dilution method was used to analyse the minimum inhibitory concentration of the test organisms by the extracts in various ratios. The different ratios of extract of Murraya koenigii and Coriandrum sativum were found to inhibit the different test organisms. As can be seen from Table 3, Shigella dysentriae in the ratio of 3:1 was found to be effective at concentration 5% (initial MIC) and at 10% conc (final MIC). Escherichia coli was found to be sensitive in the ratio 3:1 having initial MIC of 5% and final MIC of 10 %. The initial and final MIC of Klebsiella pneumoniae was found to be same i.e. at 5% concentrations. Staphylococcus aureus showed the inhibition in the ratio of 1:2 with initial and final MIC of 10%. In case of different ratios of the extracts which were tested against the organisms the ratio 3:1 was found to be more effective in comparison to other ratios. It showed the highest inhibitory effect towards Klebsiella pneumonia.

**CONCLUSION**

From the present study it can be concluded that the synergism among herbs can be a great reward in the field of Phytodrugs.

The synergism among herbs i.e. Murraya koenigii and Coriandrum sativum showed increased antibacterial effect against some of the MDR strains. The tested organisms had shown resistance towards different antibiotics but are sensitive towards the extract. The inhibitory effect increased on the combination of the two extracts. With the increase of multiple drug resistance bacteria the concept of synergism will prove to be helpful in the treatment of various diseases and can be used as raw material for the drugs in comparison to synthetic drugs.

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**REFERENCES**


