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STUDY ON MICROBIAL ANALYSIS OF STREET VENDED FOODS (SUGAR CANE JUICE AND PANI PURI) IN THE CITY OF HYDERABAD, TELANGANA, INDIA

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Food borne illnesses are usually on peak during summer as humid weather favors faster microbial growth. Street foods are more susceptible to microbial contamination. Twenty fresh samples; 10 Sugarcane juice and 10 Pani Puri, were tested for bacterial and fungal contamination using standard procedure during the month of April, 2018. The results revealed that in almost all the areas, the quality of street foods was hygienically very poor as indicated by high fungal and bacterial load. 14 out of 20 samples demonstrated fungal infestation while 17 out of 20 samples demonstrated bacterial contamination. Out of 14 samples of fungal infestation, *Aspergillus* was found in 6 samples, followed by *Saccharomyces* in 5 samples. *Rhizopus*, *Mucor*, *Penicillium* was also present. Out of 17 samples of bacterial contamination, *E.coli*, *Staphylococcus* and *Bacillus* were found in 6 samples each. Besides these, *Shigella* and *Pseudomonas* were also present. Our results demonstrate the unhygienic quality of ready-to-eat foods, thus suggesting an urgent need for Government participation in combating food borne illnesses and ensuring food safety.

Keywords: Food safety, Hygiene, Street vended foods, Microbial contamination, Bacteria, Fungi

INTRODUCTION

Food and Agriculture Organization (FAO, 1997) defines street foods as “ready-to-eat foods and beverages prepared and/or sold by vendors and hawkers especially in street and other similar public places”. Urban people of present time are being dependent on ready-to-eat or street food items because of the scarcity of money and time. Therefore, street foods are topping list in popularity. In developing countries, drinks, meals and snacks sold by street food vendors are widely consumed by millions of people (FAO, 1988). Street vended food is not only appreciated for their unique flavors, convenience and the role which they play in the cultural and social heritage of societies, it has also become important and essential for maintaining

nutritional status of populations (Dardano, 2003). The Street foods provide a source of affordable nutrients to the majority of the people especially the low-income group in the developing countries (Muzaffar *et al.*, 2009). Although there are scanty studies on street foods in India, some studies have revealed that as many as 20-30% of foods are consumed as street foods in India.

Epidemiological data indicate that cross-contamination during food preparation contributes notably to the occurrence of food-borne diseases. To ensure that food is microbiologically safe, both food handlers and the food itself must be monitored on a permanent basis. However, street foods are frequently associated with diarrhoeal diseases due to their improper handling and serving

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practices (Barro *et al.*, 2006). The most popular street foods in India are *Panipuri* or *Gol gappas*, and Sugarcane juice among beverages.

Sugarcane juice has got a lot of health benefits and has been attributed as a natural remedy to a score of problems. Sugarcane juice is a diuretic which means that it helps treat urinary tract infections, kidney stones and ensure proper functioning of the kidneys. According to Ayurveda, it helps strengthen your liver and is thus suggested as a remedy for jaundice. As an Energy Drink-Sugarcane juice is rich in the good kind of carbohydrates, protein, iron, potassium and other essential nutrients that make it the ideal energy drinks. Especially in the summer months, a glass of cold sugarcane juice and really boosts health and depleting levels of energy. It builds up plasma and body fluids and helps counter dryness and fatigue. Ayurveda also suggests that 'sugarcane juice exhibits laxative properties thereby improving bowel movement and relieving constipation'. Sugarcane juice also has alkaline properties which mean it's good for treating acidity and stomach burns. It has a low Glycemic Index (GI) so it becomes highly recommended for diabetics. Sugarcane juice is extremely rich in minerals which help prevent tooth decay and bad breath.

Raw fruit juices have always been a safety issue. First of all, all types of raw fruit juices, not just sugar cane has always been a safety issue. Raw juices can be contaminated through the equipments used, how fruits are stored and the cleanliness of the restaurant. Sugar cane is high in sugar and low in fruit acid, hence a good medium for microbes to grow. Fruits such as pineapples, limes or apples contains higher amount of fruit acid which helps slow down microbial growth. Hence it is very important to keep sugar cane chilled as it is easier to be contaminated when expose at room temperature for long hours.

Although Panipuri is very popular, easily available and cheap, it is frequently associated with various food borne diseases. Food borne illness associated with the consumption of street foods has been reported in several places in India and elsewhere (FAO, 1988; Estrada-Garcia *et al.*, 2004; Chumberet *et al.*, 2007; and Ghosh *et al.*, 2007). Selling the foods road side, unhygienic preparation and handling, insufficiency in water supply for cleaning purposes, make the street food one of the major sources of food borne diseases. In fact, in 2010, an alarming article named, "Plate of Panipuri = Dish of bacteria", was published in Times of India (Bangalore) which revealed that Panipuri

and bhelpuri sold on Bangalore streets have a high level of bacterial pathogens. Stating that the presence of high levels of bacterial pathogens leads to gastroenteritis, Dr Poornima Parthasarathy, consultant in infectious diseases at Apollo Hospital, said: "Consumption of food that contains bacterial pathogens beyond a certain level leads to faecal and oral contamination. It is very dangerous especially in the rainy season. We suggest that people boil and cool drinking water," she said.

Therefore, the present study attempts to assess the bacteriology of street vended foods, in Twin cities of Hyderabad, Telangana, India, from March to April 2018 in an attempt to throw light on the inherent risk associated with such foods. To conclude, the study emphasizes on strict implementation of hygienic measures by the food handlers and their mandatory screening for bacterial carriage and infection.

OBJECTIVES

- To analyze the Microbiological Quality of street vended food items for human consumption.
- To demonstrate the non hygienic quality of commonly available street vended foods like Sugarcane juice and Pani Puri.
- To assess the risks of unhygienic street vended foods to public health.
- To emphasize on strict implementation of hygienic measures by the food handlers and their mandatory screening for bacterial carriage and infection.

METHODOLOGY

Collection of Samples

Twenty fresh samples; ten of sugarcane juice, coded from S1-S10 and other ten of Pani Puri, coded from P11-P20, were aseptically collected in sterile containers from different locations across the city of Hyderabad and then taken to laboratory in an ice box within one hour of procurement.

Sample Processing

1 ml of each sample was poured over prepared 20 Nutrient agar plates as well as over 20 Potato dextrose plates. All NA plates were then kept in an incubator while those of PDA were kept outside at room temperature. The result of Bacterial growth (NA Plates) was expected in 24 hours whereas for that of fungal growth (PDA Plates) the results were expected in 36-48 hours.

Bacteriological Analysis of the Collected Samples

Complete glassware including Petri dishes, beakers, pipettes, conical flasks etc. was bottles were sterilized by autoclaving it for 15 minutes at 121 °C before use. Nutrient agar was used for the cultivation of bacteria; whereas, for that of fungi, Potato dextrose agar was used. Isolation technique methods like Spread plate and Streak plate has been employed to determine bacterial as well as fungal growth in the food samples. For identification of fungi and bacteria, Lacto phenol staining and Gram staining methods were employed respectively. Gram staining was followed by biochemical tests such as Indole test, Methyl Red test, Voges Proskaur test and Citrate test. Fungi were distinguished based on their morphological characteristics observed under microscope where as Bacteria were distinguished based on the staining nature obtained in the biochemical tests.

RESULTS AND DISCUSSION

Almost all the samples of Sugarcane juice and Pani Puri samples collected from various locations of the twin cities of Hyderabad were found to be contaminated with both Bacteria as well as Fungi. The samples were freshly collected from the areas of Nampally, Aghapura, Mallepally, Asif Nagar, Mehdiapatnam and Toli Chowki, Moghulpura, Gulzar houz, Charminar, etc., 14 out of 20 samples were contaminated with fungi, whereas, 17 out of 20 samples were contaminated with bacteria. *Aspergillus* was found in 6 samples, followed by *Saccharomyces* in 5 samples, *Rhizopus*, *Mucor*, *Penicillium* were among others. Once the colony was grown, smear of that particular colony was prepared implementing lacto phenol staining technique, which was then air dried and observed under microscope. The morphological characterization of each smear was studied as given in the Table 1, based on the observation, different fungi were identified.

For bacterial growth, both Gram + and Gram – bacteria was found. Gram + bacteria were found in 14 samples and Gram – bacteria was found in 8 samples. Gram – bacteria will always be rod-shaped, whereas, Gram + bacteria would either be rod or cocci shaped. Based on their staining nature, biochemical tests were carried out including Indole test, Methyl red test, Voges proskaur test and Citrate test. Depending upon the positivity or negativity of these tests, interferences were made, as given in the Table 2. *E.coli*, *Bacillus* and *Staphylococcus* was found in 6 samples each, *Klebsiella*, *Shigella* and *Pseudomonas* were also found.

These results clearly demonstrate the unhygienic practices followed by vendors which render the food unfit for consumption. This indicates not only poor hygienic quality of these street vended food items but also places consumers at a high risk of contracting food-borne infections. Improper washing of fruits/vegetables and other ingredients adds these bacteria to foods leading to contamination. In addition lack of appreciation of basic safety issues by vendors contribute to augmentation of the microbial loads. These include use of crude stands and carts, unavailability of running water for dilution and washing, prolonged preservation without refrigeration, unhygienic surroundings with swarming flies and airborne dust (Lewis *et al.*, 2006).

Lack of sanitary conditions in street vended stalls and the occurrence of pathogenic bacteria in foods are alarming enough for an immediate action by the suitable agency. Regular monitoring of the quality of street vended foods for safe human consumption must be introduced to avoid any future pathogen outbreaks.

HYPOTHESIS

Summer is the peak season for the growth and multiplication of pathogenic organisms. The various risks associated with the consumption of street vended foods include acquiring contagious diseases, contracting worms from the faecal matter carried and settled on food by the wind, developing allergies, risk of developing cancer, suffering from food-borne diseases. One can get bacterial and viral infections eating contaminated food. The bacteria can be passed from the hands of the food vendors or by the unhygienic way they prepare and serve the food. *Salmonella* bacteria infection is a major food-borne illness that one can get by eating at unhygienic places. This infection can lead to symptoms like nausea, vomiting and diarrhoea along with fever. One is also susceptible to other bacterial and viral infections such as *Rotavirus* by eating street side food. These unhygienic food stalls can become a source for disease outbreaks like cholera. Other concern is that the water used at these stalls is not filtered and sourced from unhygienic places. Especially during summer, due to a rise in temperature and humidity, there is an increase in viral and bacterial infections. Serving unhygienic food items is not only limited to street vendors but even good restaurants can do the same.

Only 6 out of 20 samples were devoid of fungus and just 3 out of 20 samples had no bacteria in them. The study

Table 1: Observation and Inference for Fungal Growth

Sample No.	Type	Area	Morphology	Result
S1	Sugarcane juice	Nampally	Fluffy and grey colonies	a) Mucor
			Flat, smooth, moist, cream in colour	b) Saccharomyces
S2	Sugarcane juice	Aghapura	Flat, smooth, moist, cream in colour	a) Saccharomyces
S3	Sugarcane juice	Old mallepally	Flat, smooth, moist, cream in colour	a) Saccharomyces
			Filamentous and cotton like structure	b) Penicillium
S4	Sugarcane juice	New mallepally	Flat, smooth, moist, cream in colour	a) Saccharomyces
S5	Sugarcane juice	Asifnagar (i)	Flat, smooth, moist, cream in colour	a) Saccharomyces
			White colonies with black conidia	b) Aspergillus
S6	Sugarcane juice	Asif nagar (ii)	-	No fungus
S7	Sugarcane juice	Asif nagar (iii)	-	No fungus
S8	Sugarcane juice	Moghulpura	Fluffy white/light grey colony	a) Rhizopus
S9	Sugarcane juice	Mehdipatnam	Fluffy white/light grey colony	a) Rhizopus
S10	Sugarcane juice	Tolichowki	White colonies with black conidia	a) Aspergillus
P11	Pani puri	Fbl ground	White colonies with black conidia	a) Aspergillus
P12	Pani puri	Panjeshah	White colonies with black conidia	a) Aspergillus
P13	Pani puri	Yakutpura	White colonies with black conidia	a) Aspergillus
P14	Pani puri	Kotla aliya	Fluffy white/light grey colony	a) Rhizopus
P15	Pani puri	Charminar	-	No fungus
P16	Pani puri	Shah ali banda	Fluffy and grey colonies	a) Mucor
P17	Pani puri	Gulzar houz	-	No fungus
P18	Pani puri	Char kaman	-	No fungus
P19	Pani puri	Bada bazar	White colonies with black conidia	a) Aspergillus
			Fluffy white/light grey colony	b) Rhizopus
P20	Pani puri	Mir alam mandi	-	No fungus

Table 2: Observation and Inference for Bacterial Growth

Sample No.	Type	Area	Staining Nature	I Test	MR Test	V.P. Test	C. Test	Result
S1	Sugarcane juice	Nampally	a) Gram +ve/rods	+	+	-	-	E.coli
S2	Sugarcane juice	Aghapura	a) Gram +ve/cocci	-	-	+	-	Staphylococcus
S3	Sugarcane juice	Old mallepally	nil	-	-	-	-	No bacteria

Table 2 (Cont.)

S4	Sugarcane juice	New mallepally	a) Gram - ve/rods	+	+	-	-	E.coli
S5	Sugarcane juice	Asifnagar (i)	a) Gram +ve/cocci	-	-	+	-	Staphylococcus
S6	Sugarcane juice	Asifnagar (ii)	a) Gram - ve/rods	-	-	-	+	Bacillus
			b) Gram +ve/cocci	-	-	+	-	Staphylococcus
S7	Sugarcane juice	Asifnagar (iii)	a) Gram -ve/rods	+	+	-	-	E.coli
S8	Sugarcane juice	Moghulpura	a) Gram - ve/rods	-	+	-	-	Shigella
S9	Sugarcane juice	Mehdipatnam	a) Gram +ve/rods	-	-	-	+	Pseudomonas
			b) Gram +ve/cocci	-	-	+	-	Staphylococcus
S10	Sugarcane juice	Tolichowki	nil	-	-	-	-	No bacteria
P11	Pani puri	Fbl ground	a) Gram - ve/rods	+	+	-	-	E.coli
P12	Pani puri	Panjesha	a) Gram +ve/rods	-	-	-	+	Bacillus
P13	Pani puri	Yakutpura	nil	-	-	-	-	No bacteria
P14	Pani puri	Kotla alija	a) Gram +ve/rods	-	-	-	+	Bacillus
P15	Pani puri	Charminar	a) Gram +ve/rods	-	-	-	+	Bacillus
			b) Gram - ve/rods	+	+	-	-	E.coli
P16	Pani puri	Shah ali banda	a) Gram +ve/rods	-	-	-	+	Bacillus
P17	Pani puri	Gulzar houz	a) Gram +ve/rods	-	-	-	+	Bacillus
P18	Pani puri	Char kaman	a) Gram +ve/cocci	-	-	+	-	Staphylococcus
			b) Gram +ve/rods	+	-	+	+	Klebsiella
P19	Pani puri	Bada bazar	a) Gram - ve/rods	+	+	-	-	E.coli
			b) Gram - ve/rods	+	-	+	+	Klebsiella
P20	Pani puri	Mir alam mandi	a) Gram +ve/cocci	-	-	+	-	Staphylococcus

Table 3: Source and Type of Hazard and the Microbial Risk Involved

1	Personal hygiene of vendors	Biological hazards	Introduction of Staphylococcus, <i>Salmonella</i> and <i>Shigella</i> via carriers.
2	Raw materials	Water	Passage of pathogens like <i>E.coli</i> , <i>Streptococci</i> , <i>Salmonella</i> and <i>Vibrio cholerae</i> .
3	Vendor Location	Improper food handling	Transfer of pathogens like <i>Salmonella</i> and <i>E.coli</i> , <i>S.aureus</i> from human body and environment into foods.
		Vegetables and spices	Introduction spore formers like <i>Bacilli</i> and <i>Clostridium</i> and pathogens like <i>L. monocytogenes</i> , <i>Shigella</i> , <i>Salmonella</i> , etc.
4	Utensils and equipments	Chemical contaminants	Leaching of chemical leading to poisoning.
		Microbial contaminants	Cross contamination of food with <i>S. aureus</i> , <i>E. coli</i> due to contaminated water, dish cloth, handler.
5	Storage and reheating	Improper storage temperature and reheating of food	Likelihood of heat stable toxins produced by pathogens like <i>C. perfringens</i> and <i>B. cereus</i> .

indicated how unhealthy and unsafe the street foods are and how negligent the government is regarding the assessment of food quality checks. The source of

contamination, type of hazard involved and the microbial risk associated with each of the microorganism is discussed in detail in Table 3.

Figure 1: Fungus-PDA Plates After 36 Hours of Inoculation

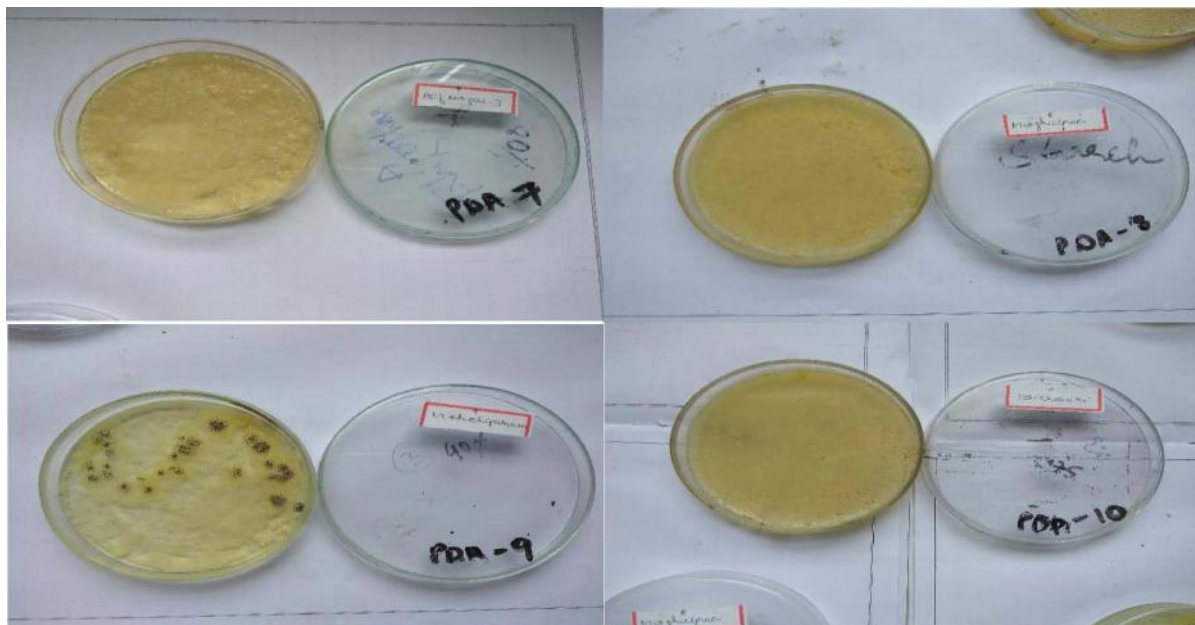
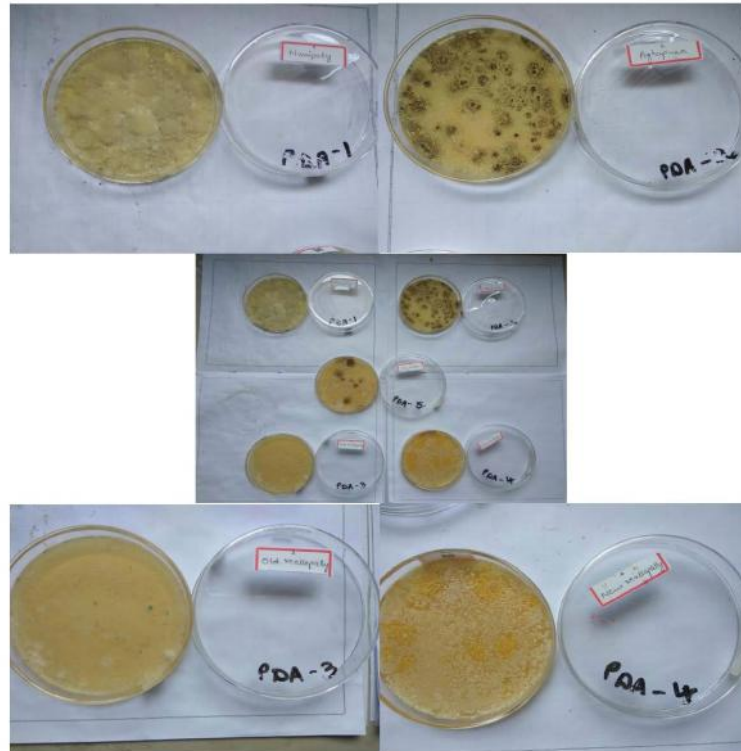


Figure 1 (Cont.)

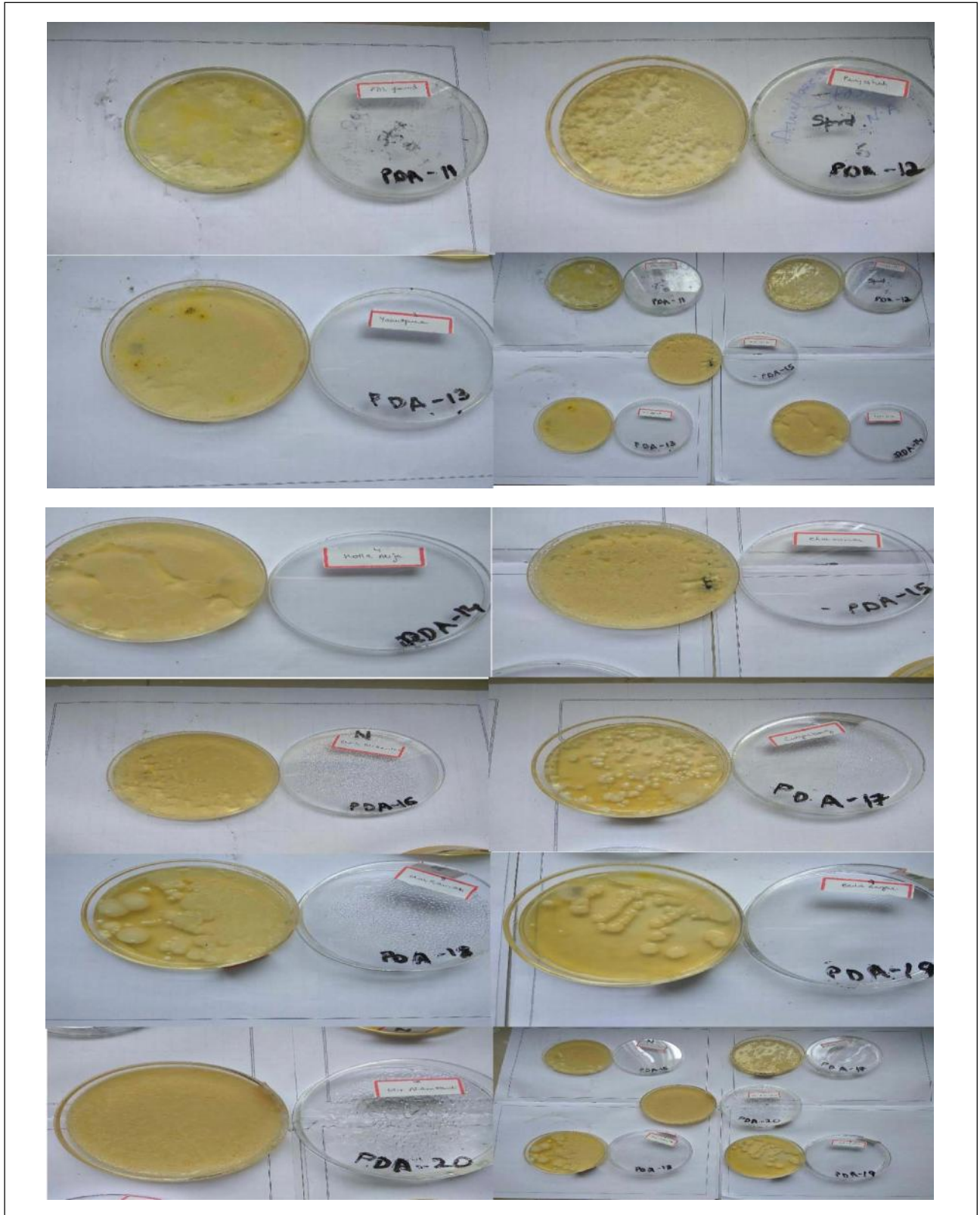


Figure 1 (Cont.)

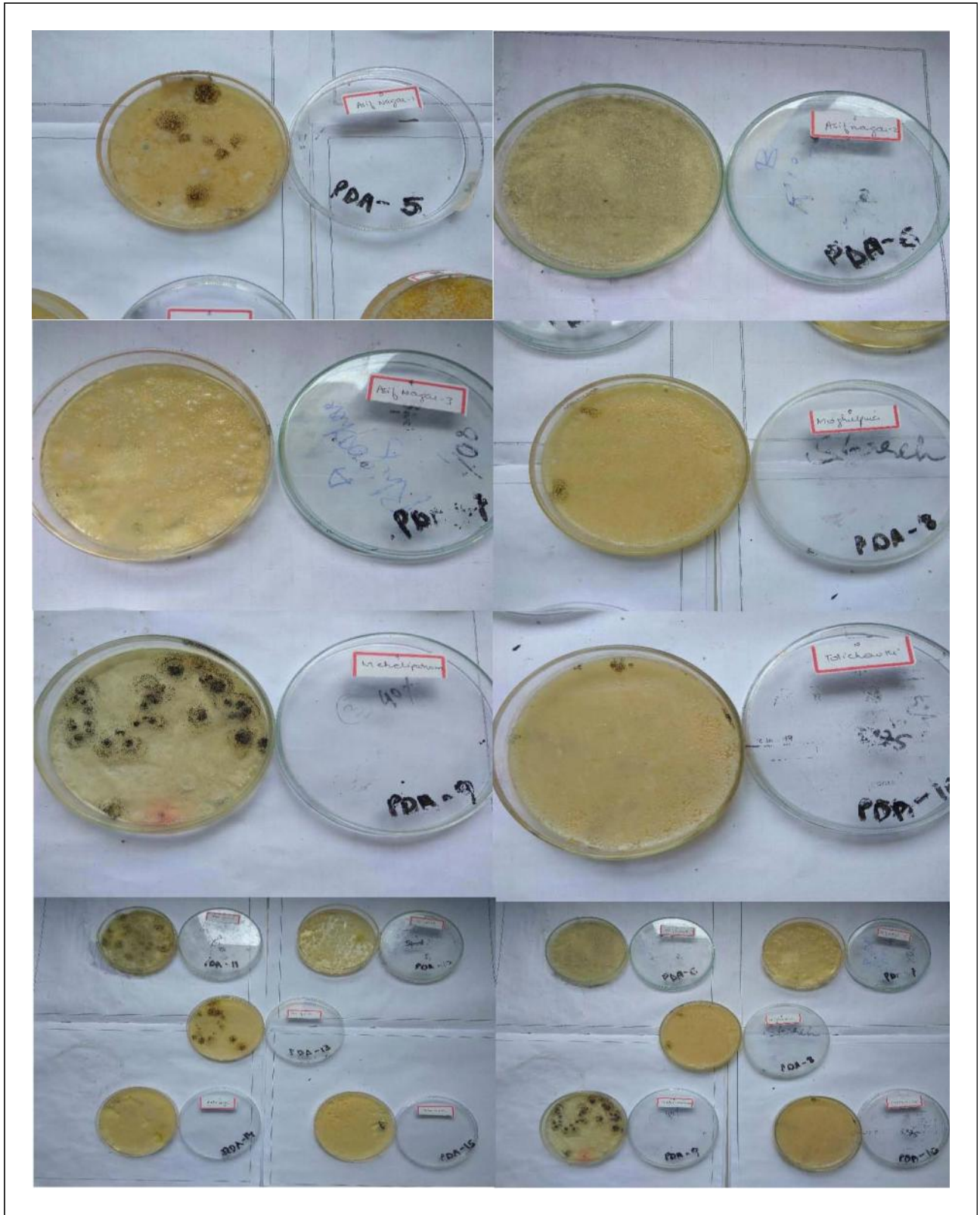


Figure 2: Fungus-PDA Plates After 48 Hours of Inoculation

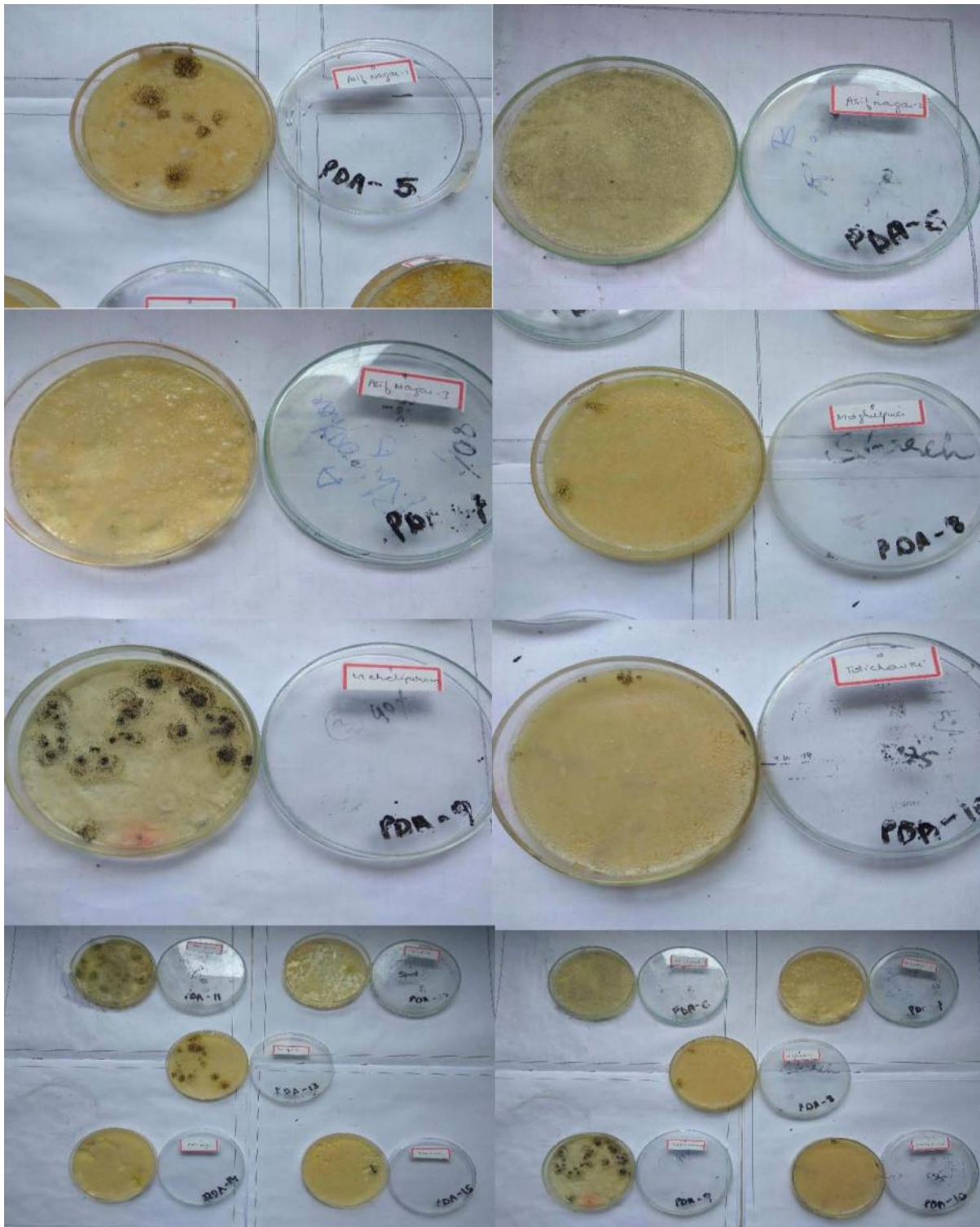


Figure 2 (Cont.)

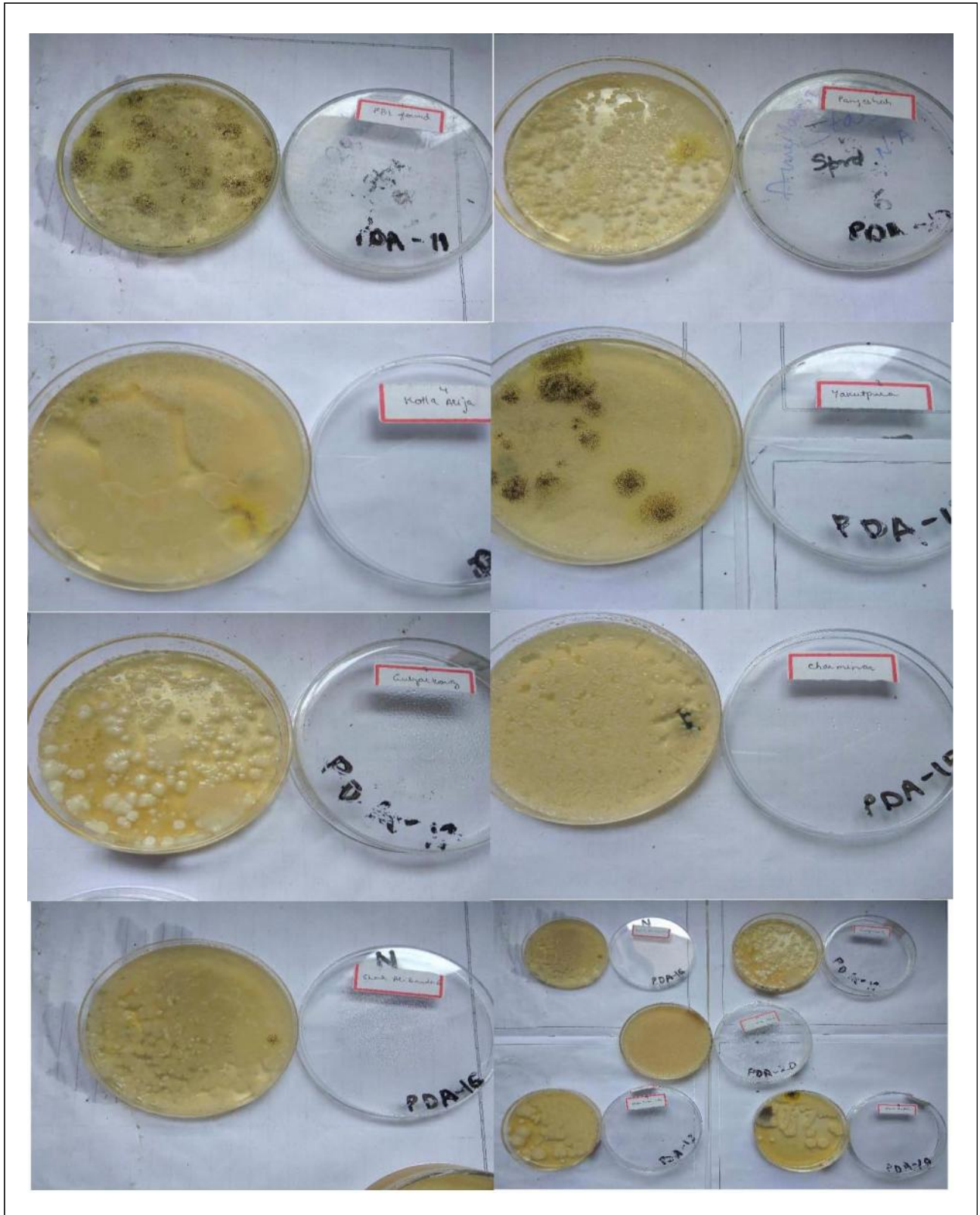


Figure 3: Bacteria-NA Plates After 24 Hours of Inoculation

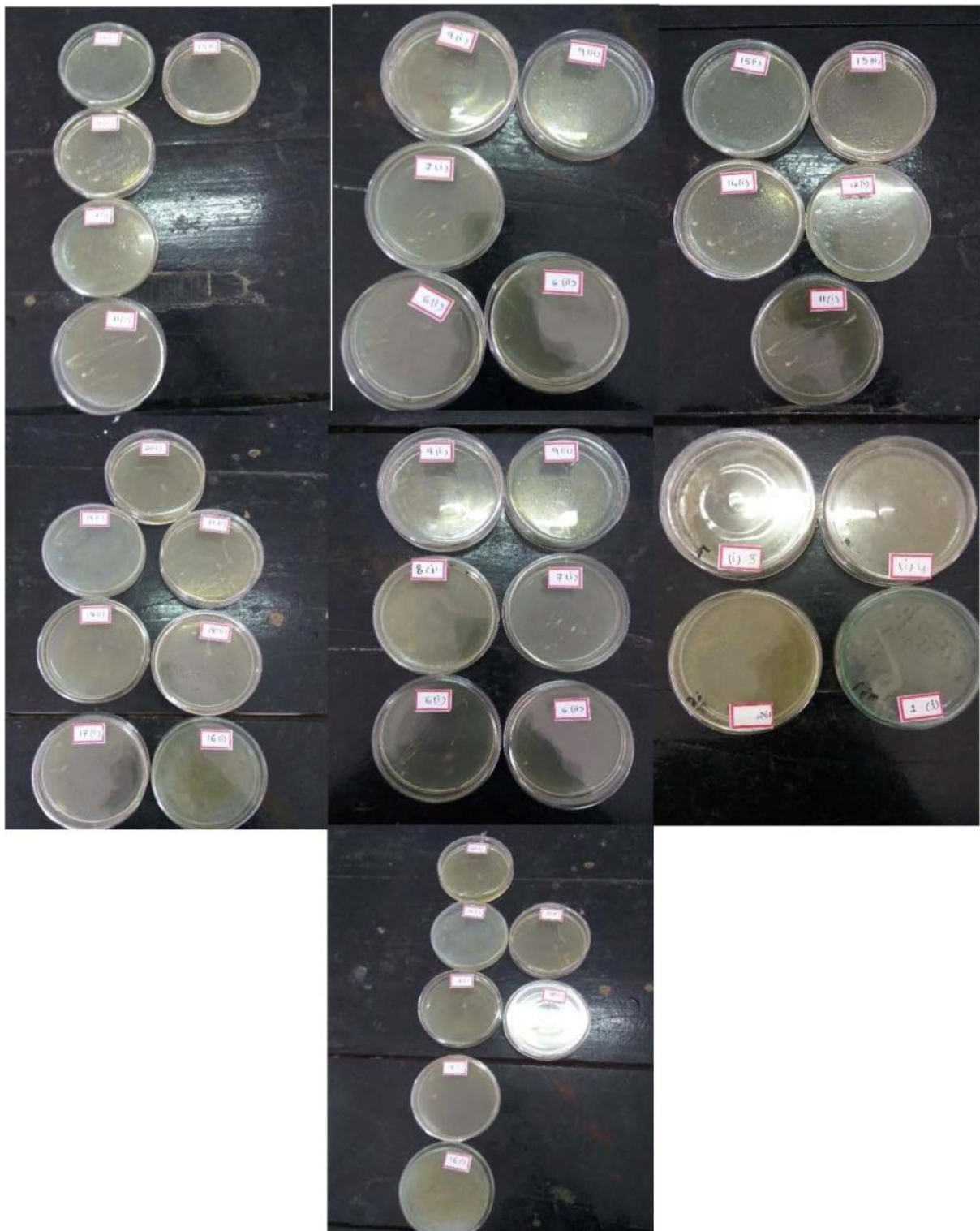


Figure 4: Bacteria-NA Plates (Pure Cultures)

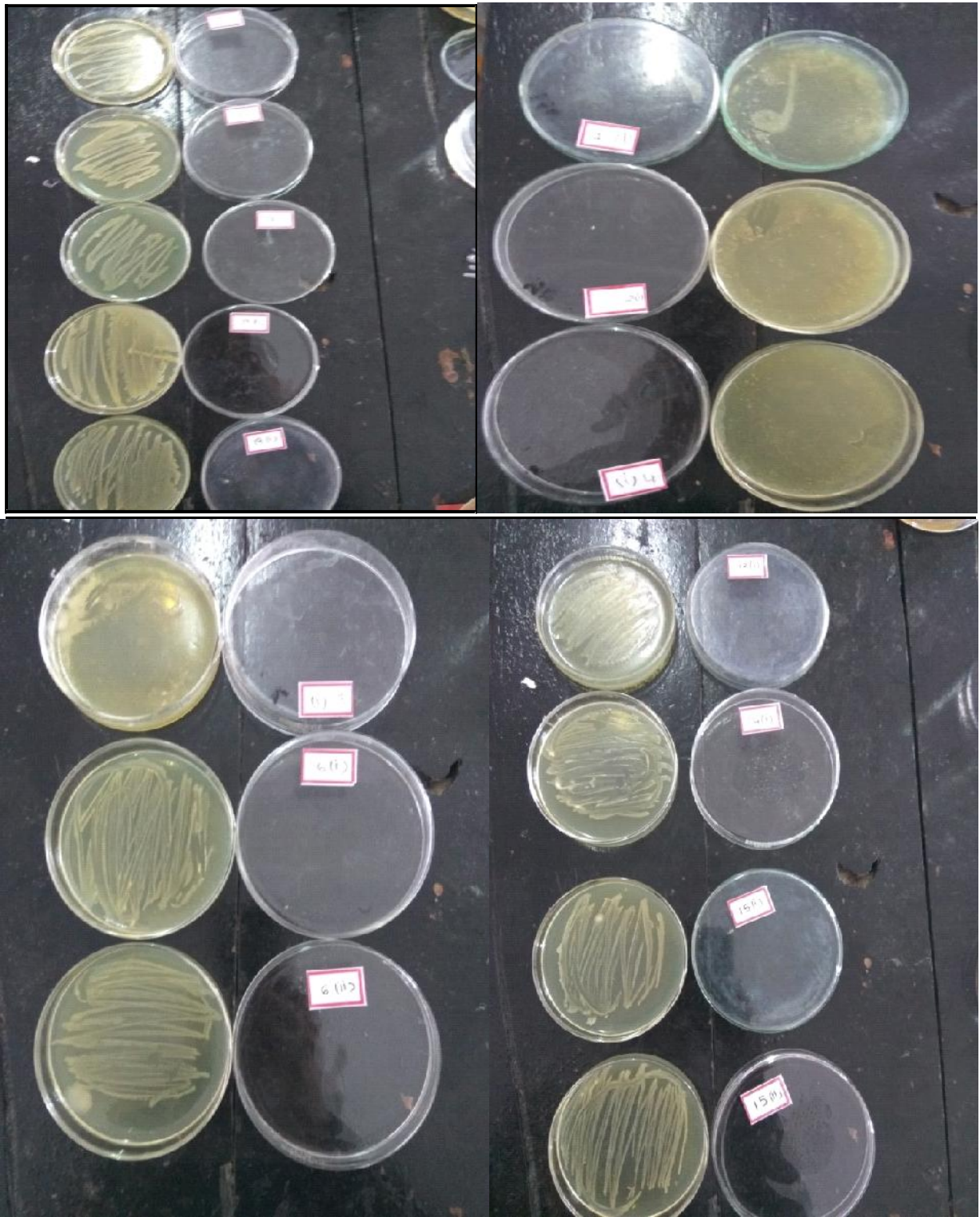


Figure 5: Smear Preparation for Identification of Bacteria

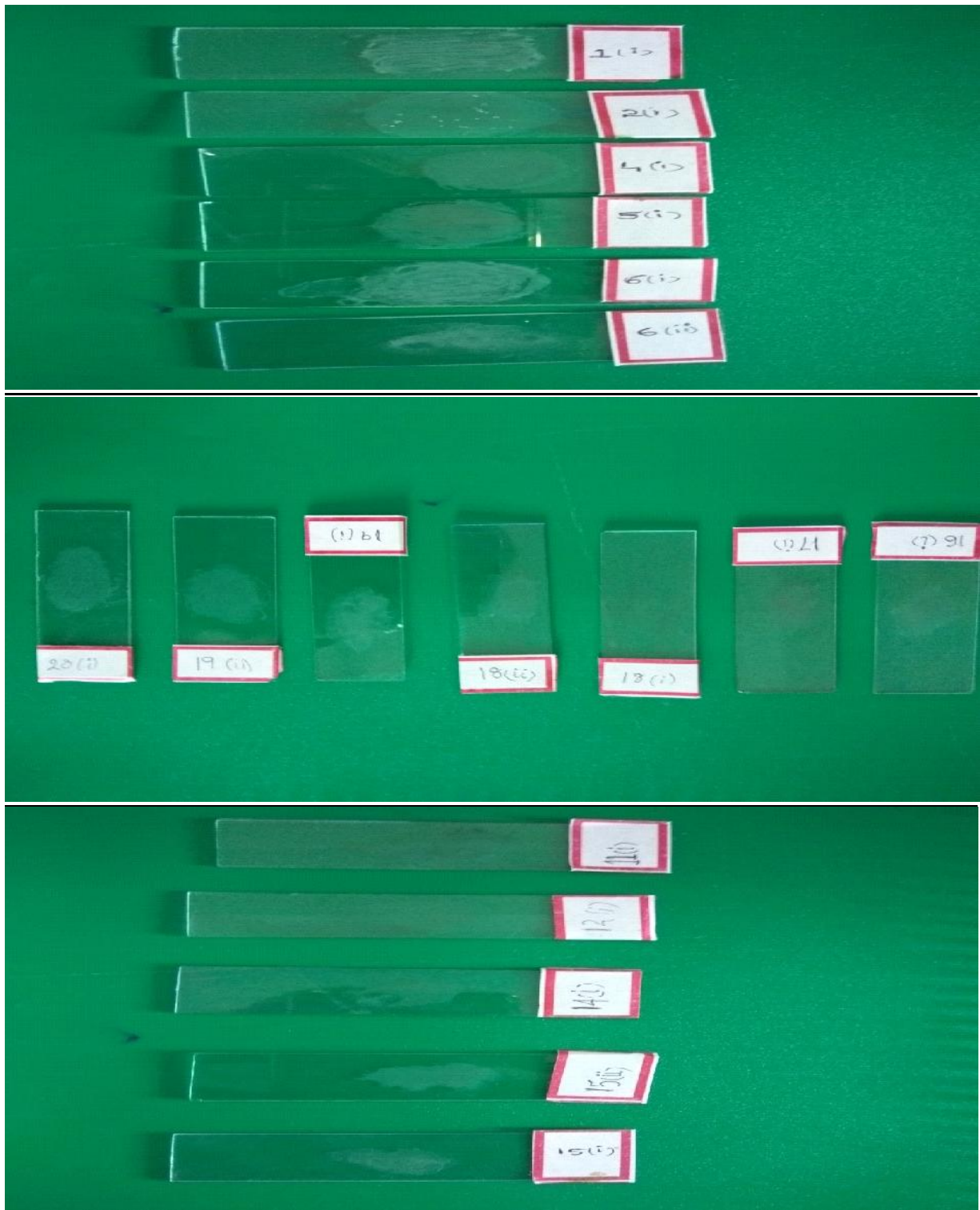
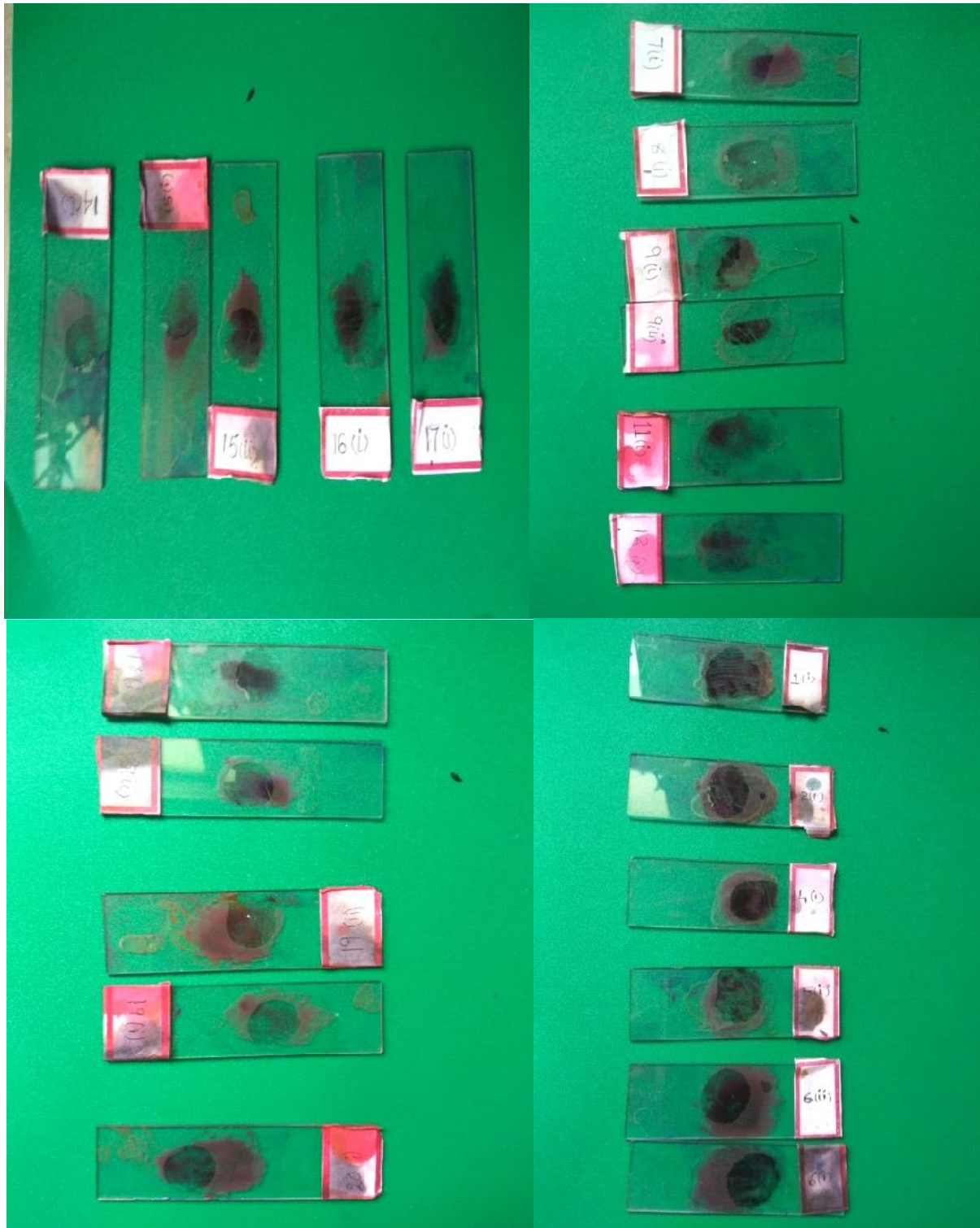


Figure 6: Gram Staining



CONCLUSION

Street foods are convenient, cheap, easily accessible and a source of income to many poor people who would otherwise not find employment. In addition, street foods contribute to the diet of many people worldwide. However, the difficulty of sanitary quality control and the low nutritional quality of street foods can be a threat to consumer's health in terms of nutritional security. Street foods could be associated with the emergence of food borne diseases, due to the ease of contamination by several agents, including pathogenic microorganisms. In addition, street foods could also be associated with the development of chronic non-communicable diseases, since street foods usually have high quantities of carbohydrates and fats. These issues indicate that pertinent health authorities should regulate the marketing of street foods and initiate appropriate training programs for school based street food vendors, for example in food borne diseases, food safety, and food security. Simultaneously, incorporation of food safety and food security messages into textbooks and school curriculum would provide opportunities for increasing awareness of people regarding food security and nutrition.

Vendors should be given some basic training on how to safely prepare and store food and businesses should be certified accordingly. Street food vendors should be encouraged to partake in awareness raising programs and given access to microcredit. In addition to helping vendors run their business in a more efficient and safe manner, cooperatives would also ease the authorities work in enforcing hygienic and business standards.

Based on the results and the interferences derived, 78% of the samples were found to be contaminated with both fungi and bacteria. This depicts a clear picture of the potential hazard of food borne diseases which are consumers are susceptible to. If proper preventive measures are not taken in the near future and strict supervision of the street practitioners is not paid enough heed then this could be one of the most serious risk factors in the deterioration of public health. This would only become possible with the government agencies coming into action and undertaking serious measures to tackle the present scenario of street vending.

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BIBLIOGRAPHY

- Al-Jeddah J H and Robinson R K (2002), "Nutritional Value and Microbiological Safety of Fresh Fruit Juices Sold Through Retail Outlets in Qatar", *Pakistan Journal of Nutrition*, Vol. 1, No. 2, pp. 79-81.
- American Public Health Association (1999), "American Water Works Association, and Water Environment Federation, Standard Methods for the Examination of Water and Wastewater", *Stand. Methods*, p. 541.
- Arijit Das and Nagananda G S (2010), "Microbiological Quality of Street Vended Indian Chaats Sold in Bangalore", *Journal of Biological Sciences*, Vol. 10, No. 3, pp. 255-260.
- Bhaskar J, Usman M, Smitha S and Bhat G K (2004), "Bacteriological Profile of Street Foods in Mangalore", *Indian J Med Microbiol.*, Vol. 22, pp. 197-197 [PubMed].
- Bryan F L (1988), "Risk of Practices, Procedures and Processes that Lead to Outbreaks of Food Borne Diseases", *J Food Prot.*, Vol. 51, pp. 663-673.
- Chumber S K, Kaushik K and Savy S (2007), "Bacteriological Analysis of Street Foods in

- Pune”, *Indian J Public Health*, Vol. 51, No. 2, pp. 470-476 [PubMed].
- Das-Mohapatra A, Rath C C, Dash S K and Mishra R K (2002), “Microbiological Evaluation of Street Foods in Bhubaneswar”, *J Food Sci Technol.*, Vol. 39, No. 1, pp. 59-61.
 - Dawson R J and Canet C (1991), “International Activities in Street Foods”, *Food Control.*, Vol. 2, pp. 135-139.
 - FEHD (2005), “The Microbiological Quality of Edible Ice from Ice Manufacturing Plants and Retail Businesses in Hong Kong”, *Risk Assessment Studies*, Report No. 21, pp. 1-27, Food and Environmental Hygiene Department, The Government of the Hong Kong Special Administrative Region.
 - Food and Agricultural Organization of the United Nations (2013), “Food for the Cities: Street Foods”.
 - Harrigan W F (1998), “Laboratory Methods in Food Microbiology”, Academic Press, London.
 - Mankee A, Ali S, Chin A, Indalsingh R, Khan R, Mohammad F, Reheman R, Sooknanan S, Tota-Maharaj R, Simeon D and Adesiyun AA (2003), “Bacteriological Quality of Doubles Sold by Street Vendors in Trinidad and the Attitudes, Knowledge and Perceptions of the Public about its Consumption and Health Risk”, *Food Microbiology*, Vol. 20, pp. 631-639.
 - Mudgil S, Aggarwal D and Ganguli A (2001), “Microbiological Analysis of Street Vended Fresh Squeezed Carrot and Kinnow-Mandarin Juices in Patiala City, India”, *Internet J. Food Safety*, Vol. 3, pp. 1-3.
 - Muzaffar A T, Huq I and Mallik B A (2009), “Entrepreneurs of the Streets: An Analytical Work on the Street Food Vendors of Dhaka City”, *International Journal of Business and Management*, Vol. 4, No. 2, pp. 80-88.
 - Namugumya B S and Muyanja C (2011), “Contribution of Street Foods to the Dietary Needs of Street Food Vendors in Kampala, Jinja and Masaka Districts, Uganda”, *Public Health Nutrition*, Vol. 15, pp. 1503-1511.
 - Ohiokpehai O (2003), “Nutritional Aspects of Street Foods in Botswana”, *Asian Network for Scientific Information Pakistan J Nutr*, Vol. 2, pp. 76-81.
 - Oliveira A C G, Seixas A S S, Sousa C P and Souza C W O (2006), “Microbiological Evaluation of Sugarcane Juice Sold at Street Stands and Juice Handling Conditions in São Carlos, São Paulo, Brazil”, *Cad. Saúde Pública, Rio de Janeiro*, Vol. 22, No. 5, pp. 1111-1114.
 - Rane S (2011), “Street Vended Food in Developing World: Hazard Analysis”, *Indian Journal of Microbiology*.
 - Reddi S G, Kumar R N, Balakrishna N and Rao V S (2015), “Microbiological Quality of Street Vended Fruit Juices in Hyderabad, India and their Association Between Food Safety Knowledge and Practices of Fruit Juice Vendors”, *Int. J. Curr. Microbiol. App. Sci.*, Vol. 4, pp. 970-982.
 - Schmidt R H, Sims C A, Parish M E, Pao S and Ismail M A (1997), “A Model HACCP Plan for Small-Scale, Fresh-Squeezed (Not Pasteurized) Citrus Juice Operations”, available at: <http://edis.ifas.ufl.edu/FS075>
 - Sharma I and Mazumdar J A (xxxx), “Assessment of Bacteriological Quality of Ready to Eat Food Vended in Streets of Silchar City, Assam, India”, Department of Microbiology, Assam University, Silchar 788011, Assam, India.
 - Tambekar D H, Jaiswal V J, Dhanorkar D V, Gulhane P B and Dudhane M N (2009), “Microbial Quality and Safety of Street Vended Fruit Juices: A Case Study of Amravati City”, *Internet J. Food Saf.*, Vol. 10, pp. 72-76.
 - Tambekar D H, Kulkarni R V, Shirsat S D and Bhadange D G (2011), “Bacteriological Quality of Street Vended Pani Puri: A Case of Amravati City (MS) India”, *Bioscience Discovery*, Vol. 2, No. 3, pp. 350-354, ISSN: 2229-3469.
 - Titarmare A, Dabholkar P and Godbole S (2009), “Bacteriological Analysis of Street Vended Fresh Fruit and Vegetable Juices in Nagpur City, India”, *Internet J. Food Safety*, Vol. 11, pp. 1-3.
 - World Health Organization (1996), “Essential Safety Requirements for Street-Vended Foods”, Food Safety Unit Division of Food and Nutrition.
 - World Health Organization (2002), “WHO Global Strategy for Food Safety: Safer Food for Better Health”, WHO Library Cataloguing-in-Publication Data, Geneva.

