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## Pathomorphological studies of lung lesions in buffalo (*Bubalus bubalis*) in southern region of Rajasthan

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### Abstract

The present study was carried out from January 2021 to November 2021 on the lungs of buffalo. During this period a total number of 98 samples of buffalo's lung, irrespective of their sex, age groups, and breeds were examined. Out of these, 76 representative samples of lungs were showed gross lesions, which were further subjected to histopathological examinations. An overall incidence of various pathological conditions was observed as 77.55%. The various forms of lungs affections were identified viz. emphysema 10.52%, atelectasis 2.63%, congestion and haemorrhages 6.57%, edema 2.63%, pneumonia 27.63% and hydatidosis 50%.

**Keywords:** Buffalo, histopathological examination, incidence, bronchopneumonia and hydatid cyst

### Introduction

The domestic water buffalo contributes a significant share of global milk production and is the major milk producing animal in several countries. Buffaloes have emerged as the prospective livestock species in India due to the triple purpose utility of milk, meat and draught. It is benefitting the farmers as well as the country's economy and food security (G.C. Banerjee, 1998) [5]. Lung affections are one of the most fatal and frequent health issues affecting the buffaloes. The thick connective tissue septa help in localization of infection and modified to thickened and oedematous, this may cause obstruction of airways while exhaling which leads to imbalance between inspiratory and expiratory volume (Argade *et al.*, 2019) [4]. The disease of lungs which may be either acute or chronic can cause debility and death resulting in great economic losses.

### Material and Methods

#### Sample collection

A total of 98 buffalo's lung were examined out of which 76 animals showed various gross lesions of pathological significance in the lung used as material for the present study. The samples were collected from carcasses of buffaloes subjected to post-mortem examination to various veterinary clinics and various slaughter houses located in Udaipur, Dungarpur, Chittorgarh and Rajsamand districts of southern Rajasthan during the period from January 2021 to November 2021.

#### Histopathology examination

Formalin-fixed tissues were processed by routine acetone-xylene technique, impregnated and embedded in paraffin wax. Sections were cut at 4-5  $\mu$ m thickness with the help of semi-automatic rotary microtome (Lillie, 1965) [12]. The sections were stained with haematoxylin and eosin (H&E) stain following conventional procedure (Luna, 1968) [14].

### Results and Discussion

Total 76 tissue samples out of 98 samples were revealed definite lesions on gross and histopathological examination of lung in southern region of Rajasthan. In the present investigation, 77.55% incidences of pathomorphological lesions in lungs of buffaloes were noted. Tahssin and Alsamad (2020) [19], Renu *et al.* (2021) [17] and Akalu *et al.* (2021) [1] reported an incidence of 23.21%, 47.48% and 91.76%. The lesions were grouped into abnormalities of inflation 10 (13.15%), circulatory disturbances 7 (9.21%), types of pneumonia 21 (27.63%) and parasitic condition 38 (50%).

This variability in the incidence might be attributed to different geographical areas and different methods of management system. The higher incidence of pathomorphological lesions in lung confirms that lung is the organ which is comparatively more susceptible to exposure to physical, chemical, and biological injuries because of its anatomical and histological characteristics.

**Table 1:** Details of various pathological conditions in lungs of buffaloes

S. No.	Types of conditions	Number	Percentage
I	<b>Abnormalities of inflation</b>	10	13.15%
	i. Pulmonary emphysema	8	10.52%
	ii. Atelectasis	2	2.63%
II	<b>Circulatory disturbances</b>	7	9.21%
	i. Congestion and haemorrhages	5	6.57%
	ii. Edema	2	2.63%
III	<b>Types of pneumonias</b>	21	27.63%
	i. Bronchopneumonia	15	19.73%
	a. Suppurative bronchopneumonia	12	15.78%
	b. Fibrinous bronchopneumonia	3	3.94%
	ii. Interstitial pneumonia	4	5.26%
	iii. Haemorrhagic pneumonia	2	2.63%
IV	<b>Parasitic conditions</b>	38	50%
	i. Hydatidosis		

### Abnormality of inflation

Abnormalities of inflation were noticed in 10 cases with the incidence of 13.15%. emphysema and atelectasis were included in abnormalities of inflation with the incidence of 10.52% and 2.63% respectively. Interstitial and alveolar emphysema was observed. [Fig. 1] Grossly, the emphysematous lungs were voluminous and greyish pale in color. A crepitating sound was heard on pressing and on cutting the affected portion. Emphysematous areas did not sink in the water. Microscopically, the alveoli were distended irregularly and due to rupture of inter alveolar walls, formation of air bubbles of variable sizes were seen in the lungs. The intact alveolar septa were thin and stretched with no blood. While the ruptured septa appeared as stumps projecting into the lumen. Pulmonary emphysema was reported earlier by Machhaliya *et al.* (2015) [15] and Renu *et al.* (2021) [17] with an incidence of 10.63% and 8.15% respectively. Decreased collateral ventilation makes them susceptible to interstitial emphysema. Agonal expiration in slaughtered animal makes their lungs prone to agonal emphysema. In pulmonary atelectasis, atelectatic lungs were dark and depressed. Microscopic examination, they showed collapse of the alveolar lumen with thickened interalveolar septa. Zeryhun and Alemu (2017) [24] and Tahssin and Alsamad (2020) [19] noted the higher prevalence of atelectasis with 6.4% and 5.83% respectively which might be the result of poor prevention of disease in that area and exposure of animals to stress factors like dust and overcrowding.

### Circulatory disturbances

The incidence of circulatory disturbances was observed as 9.21% in the present study held at southern region of Rajasthan. Pulmonary congestion and haemorrhages were seen in 5 cases with the incidence of 6.57%. Grossly, diffuse areas of congestion and haemorrhages were noticed in all lobes of lungs. [Fig. 2] Microscopically, alveolar capillaries and blood vessels were filled with blood in case of congestion and haemorrhages were noticed in the lumen of alveoli and bronchioles. [Fig. 3] The same consistency with the present

findings were also noted by Belkhiri *et al.* (2009) [6] and Benhathat and Aggad (2017) [7] with the incidence of 7.89% and 5.35% respectively. The higher incidence of congestion and haemorrhages was observed by Gebrehiwot *et al.* (2015) [9] and Rana *et al.* (2020) [16]. Congestion is the result of decreased outflow of venous blood which means it is a passive process. Haemorrhages might be attributed to trauma, pulmonary thromboembolism, septicaemia and disseminated intravascular coagulation. Pulmonary edema was observed in 2 cases (2.63%). Grossly, the lungs were enlarged and firm. When the surface was cut, edematous fluid was oozed out. Prominent alveolar septa were seen. Microscopically, a pink stained homogenous material was seen in alveoli and bronchi. This result shows coherence with the findings of Akbor *et al.* (2007) [2], Benhathat and Aggad (2017) [7] and Syaghuswa and Vyambwera (2020) [18] with the incidence of 3.75%, 0.98%, 0.91% respectively. Higher incidence of circulatory disturbance was noticed by Rana *et al.* (2020) [16].

### Pneumonia

Pneumonia of different types was noticed during the study. A total of 21 cases showed pneumonia with the incidence of 27.63%. Yalaw *et al.* (2018) [23] and Rana *et al.* (2020) [16] had the strong affirmation with this finding with the incidence of 33.33%. Emran *et al.* (2013) [8] observed the 18.5% incidence of pneumonia in lungs of buffalo. This wide variation in these findings might be due to different location, management practices, age of the animals and different stress factors. Bronchopneumonia was noticed in 15 cases with the incidence of 19.73%, further noticed in two forms, suppurative bronchopneumonia with the incidence of 15.78% and fibrinous bronchopneumonia with the incidence of 3.94%. The incidence of interstitial pneumonia was 5.26% and the haemorrhagic pneumonia was 2.63%. In suppurative bronchopneumonia, grossly, the lungs were enlarged, firm and consolidated cranioventrally. The affected lobe had mosaic appearance due to patchy to diffuse areas of consolidation with intermingling normal. The pleura over the affected portion were grey or grayish yellow. Cut section revealed pale and dark areas with purulent and mucopurulent exudates in the bronchi and bronchioles. Microscopic examination revealed the localised lesions in lungs. The alveolar capillaries were congested, dilated and haemorrhages were also noticed. The lumen of alveoli, bronchi and bronchioles was filled with edematous fluid, inflammatory cellular exudates consisting of abundant neutrophils, few macrophages and cellular debris. [Fig. 11]. In chronic suppurative bronchopneumonia lobular pattern of consolidation was noticed in apical and diaphragmatic lobes. There were small purulent foci which were multiple in number. The airways were filled with purulent exudates. Microscopically, there were infiltration of polymorphs and mononuclear cells in the lumen of bronchi, bronchioles and alveoli. There was fibrous thickening of alveolar septa with cellular exudate in and around the wall of alveoli. Neutrophils were the predominant cells in the areas of suppuration. Pulmonary fibrosis, abscess formation, bronchiectasis and hyperplasia of lymphoid tissue were noticed in few cases. [Fig. 12]. Emran *et al.* (2013) [8] found the same cranioventral consolidation and Benhathat and Aggad (2017) [7] and Yadav *et al.* (2015) [22] also noticed similar gross changes in the pneumonic lung. In case of fibrinous bronchopneumonia, gross examination revealed, lungs were heavy, enlarged, grey to dark red in color and firm in consistency. Lung had

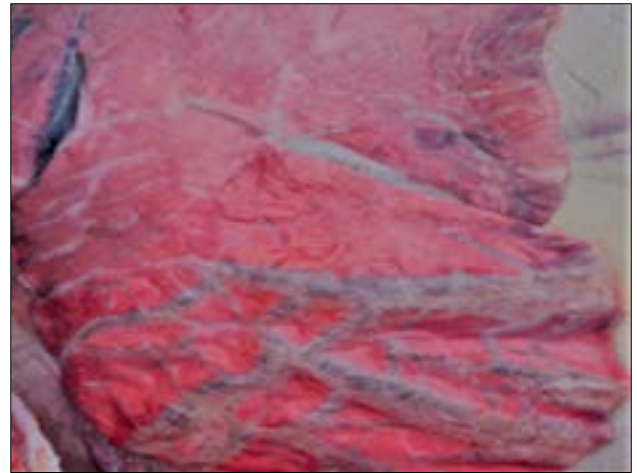
tendency to sink on immersing in water. Interlobular septa were prominent. When the section was cut, there were oozing of serous exudate with fibrin from the bronchi. [Fig. 4]. The pleura was thickened and whitish grey in color. Fibrinous adhesions with the thoracic wall were also seen in some cases. Microscopically, there were the predominance of fibrinous exudates, intermingling with inflammatory cells in the alveolar septa. Alveolar capillaries were congested and alveoli were dilated. Alveoli were filled with fibrinous exudates, erythrocytes, few neutrophils and a large number of mononuclear cells. The interlobular septa were dilated, edematous and filled with fibrin. [Fig. 10]. Yalew *et al.* (2018) [23], Yadav *et al.* (2015) [21] and Tahssin and Methaq (2020) [19] noticed the similar changes as described in the present study.

On the gross examination of lung in case of Interstitial pneumonia, lungs were pale, heavy and failed to collapse. Cut section revealed a slightly meaty appearance. Microscopically, thickening of inter-alveolar septa due to septal cell proliferation and infiltration of mononuclear cell was observed. The alveoli were distorted in shape. Hyperplasia of bronchial and bronchiolar epithelium into the lumen was observed. [Fig. 9]. In chronic interstitial pneumonia, deposition of fibrous tissue was noticed in interlobular septa and in or around the bronchioles. These findings showed coherence with the findings of Tahssin and Methaq (2020) [19] and Zhang *et al.* (2020) [25]. Haemorrhagic pneumonia, grossly, intensely red to brownish black patchy areas involving both apical and diaphragmatic lobes were observed. On incision of section affected, oozing of blood from the affected zone. Microscopically, the alveoli were partially or completely filled with erythrocytes and some amount of serous fluid admixed with some leukocytes. Some of the alveoli and bronchioles revealed a homogenous eosinophilic mass. [Fig. 8]. Renu *et al.* (2021) [17] also noted the engorgement of alveoli with erythrocytes and edematous fluid. These lesions were similar as observed by Valles *et al.* (2015) [20] and Renu *et al.* (2021) [17].

### Hydatidosis

Hydatidosis was observed in 38 cases out of total 76 pulmonary findings with the incidence of 50%. On gross examination, lung showed, multiple cysts of different sizes, located either superficially or deeply in the lung parenchyma. The cysts were filled with clear watery or serous fluid and were soft or fluctuating. On cut section, cysts were unilocular, most cases, watery fluid was escaped when the cysts were punctured. [Fig. 5 & 6] Few cysts were fertile with multiple cream coloured brood capsules were recorded. On the microscopic examination, hydatid cyst revealed, from within outward a germinal layer, a thick laminated elastic layer of hyaline membrane which was concentric. [Fig. 7] The hyaline layer was surrounded by connective tissue with infiltration of lymphocytes, macrophages and in some cases neutrophils and eosinophils were also noticed. In some cases, the hydatid cyst was surrounded by a zone of necrosis which was eosinophilic in nature. Variability in intensity of cellular infiltration was noticed. The neighbouring parenchyma was showing the congestion, atelectasis, compensatory emphysema, interstitial and purulent bronchopneumonia. Machhaliya *et al.* (2015) [15] noted the hydatidosis as the principal factor for causing damage to the lung parenchyma in his study. along with Zeryehun and Alemu (2017) [24] and Benhathat and Aggad (2017) [7]. Kamdi *et al.* (2018) [10] noted same microscopic

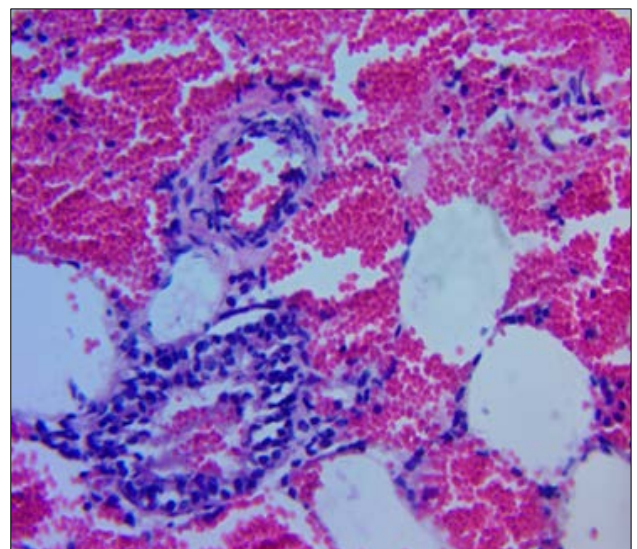
lesions with the presence of interstitial and bronchopneumonia. These gross & microscopic lesions showing the strong affirmation with the findings of Lat-lat *et al.* (2006) [11] and Belkhiri *et al.* (2009) [6].



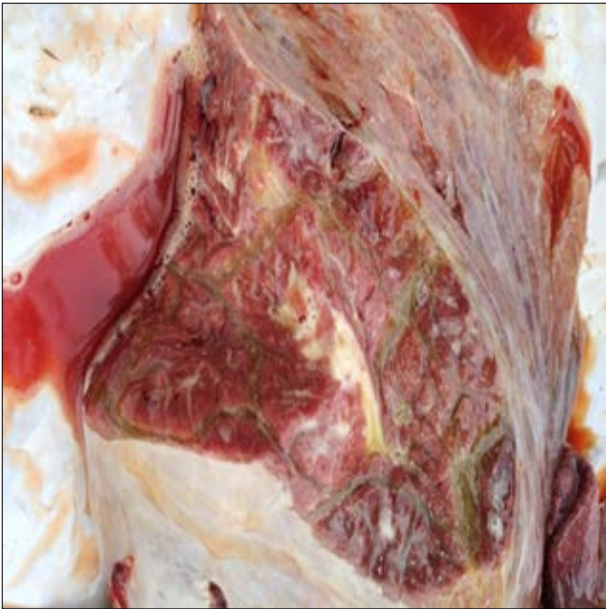
**Fig 1:** Interstitial emphysema- bubbles of in the interstitial septa



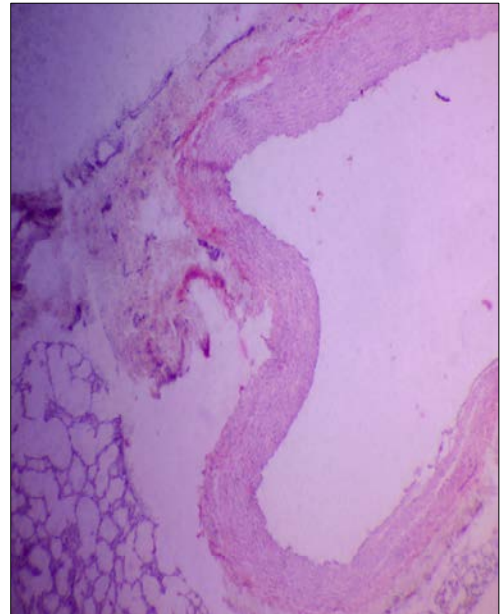
**Fig 2:** Haemorrhage-subpleural trapped air foci with variability in sizes.



**Fig 3:** Haemorrhage-microphotograph showing erythrocytes in lumen of alveoli and bronchioles with alveolar septal fibrosis. H&E, 400X.



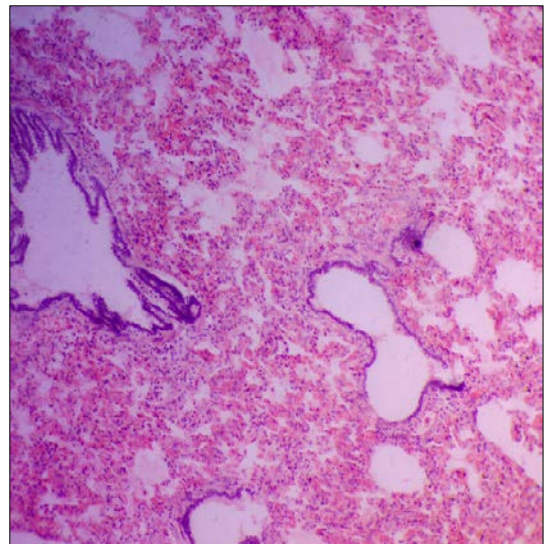
**Fig 4:** fibrinous bronchopneumonia - oozing of fibrinous exudate.



**Fig 7:** Microphotograph having concentric layers of hyaline in cyst wall. H&E, 40X.



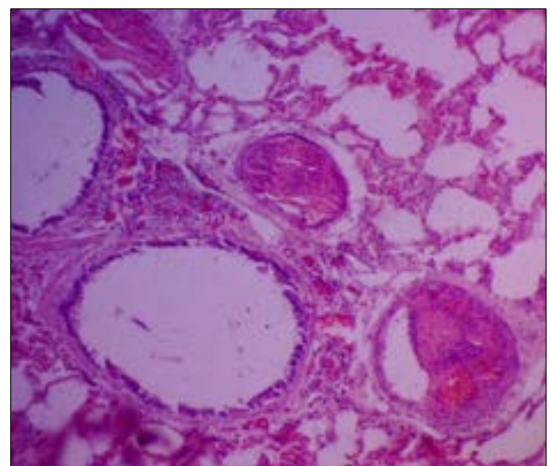
**Fig 5:** Gross picture showing the hydatid cyst in the lung parenchyma.



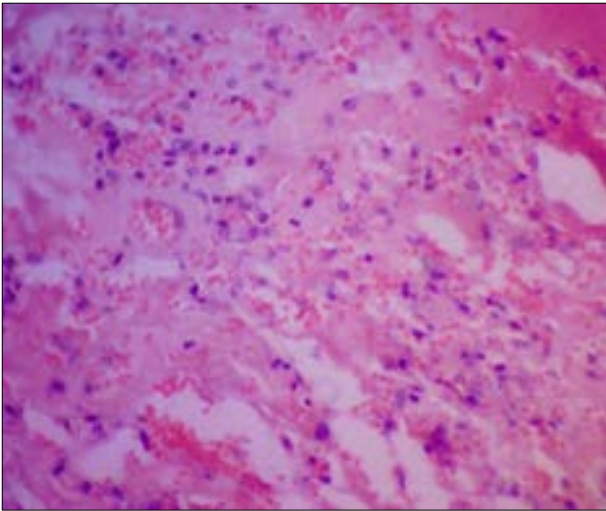
**Fig 8:** Haemorrhagic pneumonia- microphotograph showing infiltration of erythrocytes, fibrin and inflammatory cells in alveoli and interstitium. H&E, 100X



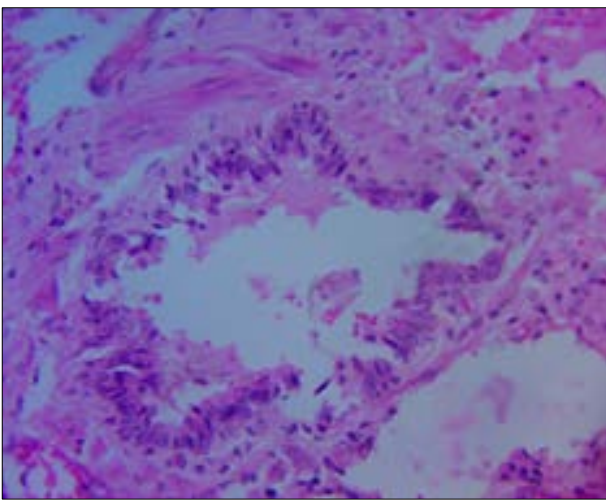
**Fig 6:** Cut section showing the Yellow and white translucent membrane attached to cyst wall



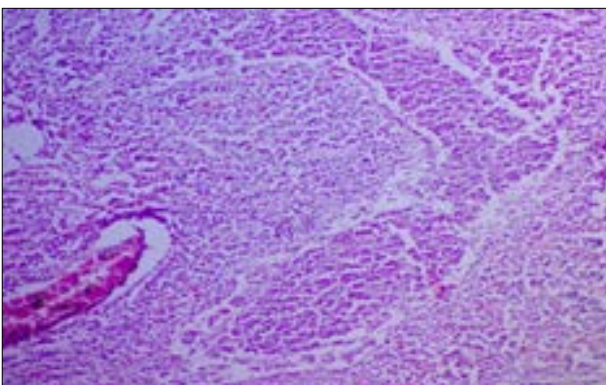
**Fig 9:** Interstitial pneumonia- microphotograph of lung showing the thickening of alveolar partitions, presence of edema, and free alveolar cavities. H&E, 100X.



**Fig 10:** Fibrinous bronchopneumonia- microphotograph of lung showing the fibrinous exudate. H&E, 400X.



**Fig 11:** Acute suppurative bronchopneumonia-microphotograph showing the infiltration of cellular exudate and filling of bronchiole with edema, desquamation of bronchiolar epithelium and surrounded by fibrous tissue along with large air space. H&E, 400X.



**Fig 12:** Chronic suppurative bronchopneumonia- microphotograph showing the inflammatory exudate in bronchial lumen, sero-purulent exudate in alveoli, infiltration of leucocytes and necrosis at some places. H&E, 100X.

## References

1. Akalu M, Murthy B, Abayeneh T, Gelaye E. Major bacterial pathogens of bovine respiratory disease and lung lesions in calves from selected areas of Ethiopia. *The Thai Journal of Veterinary Medicine*. 2021;51(3):501-508.
2. Akbor M, Haider MG, Ahmedullah F, Khan MAHNA, Hossain MI, Hossain MM. Pathology of trachea and lungs of buffaloes. *Bangladesh Journal of Veterinary Medicine*. 2007;5(1-2):87-91.
3. Amandeep Singh. *Vet Extension. Livestock Production Statistics of India*. 2019. Retrived on May 21, 2020, from <https://www.vetextension.com/livestock-animal-production-statistics-of-india-2019/>.
4. Argade S, Gumasta P, Patel SK, Jolhe DK, Pandey MK, Sonwani AK, *et al*. Pathology of pulmonary emphysema in Murrah buffalo. *Journal of Entomology and Zoology Studies*. 2019;7(1):1423-1425.
5. Banerjee GC. *A textbook of animal husbandry*. West Bengal: Kalyani University, 1998, 697-726.
6. Belkhiri M, Tlidge M, Benhathat Y, Meziane T. Histopathological study and pulmonary classification of bovine lesions. *African Journal of Agricultural Research*. 2009;4(7):584-591.
7. Benhathat Y, Aggad H. Occurrence and severity of major gross pulmonary lesions in cattle slaughtered at Tiaret. *Journal of Applied Environmental and Biological Sciences*. 2017;7(10):48-53.
8. Emran R, Sarfinaz S, El-Ghany A, El-Shafey DYH, Dalia MM. Immunohisto- chemistry as a diagnostic tool for *Mycoplasma bovis* in buffalo calves. 12<sup>th</sup> Science Congress, Egyptian society for Cattle Diseases; Hurgada, Egypt. 2013.
9. Gebrehiwot T, Verma PC, Berhanu H. Study on gross pulmonary lesions in lungs of slaughtered animals and their economic importance in Tigray, Ethiopia. *Momona Ethiopian Journal of Science*. 2015;7(1):46-54.
10. Kamdi BP, Singh S, Kumar P, Singh V, Singh R. Pulmonary hydatidosis in buffalo calves. *Indian Journal of Veterinary Pathology*. 2018;42(4):296-298.
11. Lat-Lat H, Hassan I, Sani RA, Sheikh-Omar AR, Chandrasegaram S. Condemnation of lungs in abattoir in Peninsular Malaysia due to parasitic infection from 1998-2004. *Tropical Biomedicine*. 2006;23(1):61-68.
12. Lillie RD. *Histopathological technique and practical histochemistry*. McGraw Hill Book Co., New york and London, 1965.
13. *Livestock Census 20<sup>th</sup>*. DADF, DADF, Ministry of Fisheries, Animal Husbandry and Dairying, GoI, 2020.
14. Luna LG. *Manual of histological staining methods of the armed forces institute of pathology*. 3<sup>rd</sup> edition, McGraw Hill Book Co., New York, 1968.
15. Machhaliya MH, Patel BJ, Joshi DV, Raval SH, Patel JG. Pathomorphological studies on spontaneously occurring pulmonary lesions in buffaloes (*Bubalus bubalis*). *Ruminant Science*. 2015;4(1):51-53.
16. Rana DS, Narang G, Jangir BL. Pathomorphological and immunohistochemical studies on the lungs of bovines with respiratory affections. *Haryana Veterinary*. 2021;60(1):123-127.
17. Renu, Boyal PK, Dadhich H. Occurrence and pathomorphology of respiratory system in cattle. *Journal of Entomology and Zoology studies*. 2021;9(1):1371-1377.
18. Syaghuswa KB, Vyambwera GCK. Pulmonary lesions of cattle and associated financial losses at the butembo public slaughterhouse in Democratic Republic of Congo. *Animal Research International*. 2020;17(3):3911-3917.

19. Tahssin SC, Alsamad MAA. Histopathological study of pulmonary lesions in the lungs of water buffaloes (*Bubalus bubalis*) in the abattoir of basrah province in southern Iraq. *Basrah Journal of Veterinary Research*. 2020;19(2):236-258.
20. Valles JA, Apley MD, Reinhardt CD, Bartle SJ, Thomson DU. Pathologies of acute interstitial pneumonia in feedlot cattle. *American Journal of Animal and Veterinary Sciences*. 2016;11(1):1-7.
21. Yadav J, Dadhich H, Singh G. Occurrence and pathology of fibrinous pneumonia in dogs (*Canis familiaris*). *Veterinary Practitioner*. 2015;16(2):228.
22. Yadav J, Dadhich H, Singh G. Occurrence and pathology of broncho pneumonia in dogs (*Canis familiaris*). *Veterinary Practitioner*. 2015;16(1):20.
23. Yalew KW, Awol N, Tsegay Y, Abraha H, Wlmariam H. A study on gross and histopathological pulmonary lesions of cattle slaughtered at Abergelle abattoir Mekelle, Tigray, Ethiopia. *Journal of Veterinary Medicine and Animal Health*. 2018;10(6):148-152.
24. Zeryehun T, Alemu B. Major gross lesions of lung in cattle slaughtered at Hawassa municipal abattoir, Southern Ethiopia. *Journal of Veterinary Medicine*, 2017, 1-7.
25. Zhang M, Hill JE, Godson DL, Ngeleka M, Fernando C, Huang Y. The pulmonary virome, bacteriological and histopathological findings in bovine respiratory disease from western Canada. *Transboundary and emerging diseases*. 2020;67(2):924-934.