A study for comparison between immune status of dairy Egyptain buffaloes and the crosses of Egyptain-Italian buffaloes under the Egyptian environment

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Abstract: A total of 70 milk samples (35 milk samples from Egyptian buffaloes and 35 milk samples from Egyptain-Italian buffaloes) collected from dairy buffalo farm in Egypt through the period from January to December 2014 used for the evaluation. Sample was examined for California mastitis test (CMT) and somatic cell count (SCC). Also measure of milk constituent by using infra milk analyzer 150, from Bentley. Studies were included total milk yield (TMY), lactation period (L), percent of protein and fats in milk also calculated the present of lysozymes and nitric oxide to measure the immune status. In this study we recorded age of first calving was 32 months in Egyptain buffaloes while in Egyptain- Italian buffaloes 28 month. The lactation period was 257 days in Egyptain buffaloes while in Egyptain- Italian buffaloes 281 days. Also, the average milk/day was 7-8liters/day for Egyptain buffaloes but in Egyptain- Italian buffaloes recorded 12-14 liters/day. The mastitic cases in the season were highest rates in Egyptain buffaloes about 10 (14.29%) while in Egyptain- Italian buffaloes 2 (2.86%). In this study, protein contents were significantly higher ($P<0.05$) in Egyptain-Italian buffaloes (4.16± 0.22%) compared with Egyptain buffaloes (3.69±0.14%). The fat percent in Egyptain buffaloes was 5.48±0.31gm while in Egyptian-Italian buffaloes were 9.23±0.40 gm. In this study lactose percent was 5.13 ±0.28 mg% in Egyptain buffaloes while recorded 5. 7 ± 0.27mg% in Egyptian-Italian buffaloes. Also the percent of SNF was 9.25±0.4mg% in Egyptain buffaloes while recorded 10. 75±-0.51 mg% in Egyptian-Italian buffaloes. Salt value recorded 70 – 75 IU in Egyptain buffaloes while recorded 8 – 9.5 IU in Egyptian-Italian buffaloes. SCC was 130 x 10^3 to 170 x 10^3/ml in Egyptain buffalo milk but 100 x 10^3 to 120 x 10^3/ ml in Egyptain-Italian buffalo milk. The immune status recorded 262.4 ± 81. 8 for production of lysozyme in Egyptain buffaloes while recorded 188. 8 ±67.5 in Egyptain-Italian buffaloes. The measurement of nitric oxide production was 182.21 ±41.5 in Egyptain buffaloes while in Egyptian-Italian buffaloes 198 ± 30.2. It can be concluded that paying more attention to the genetic improvement of the Egyptian buffalo is quite likely to improve its productive performance using Italian buffalo for improving the national milk production from buffalo. More studies are needed for the productive, reproductive and genetic diversity of crossbred populations before the enhancement of crossbreeding activities on national level.

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1. Introduction:

The water buffalo or domestic Asian water buffalo (*Bubalus bubalis*) is a large bovid found on the Indian, Vietnam, Malaysia,, Philippines, and Borneo. The wild water buffalo (*Bubalus arnee*) native to Southeast Asia is considered a different species but most likely represents of domestic water buffalo. Two extant types of water buffalo are recognized based on morphological and behavioral criteria the river buffalo found in South Asia, Egypt and Italy **(Lau, et al., 1998).**

The present day river buffalo is the result of complex domestication processes involving more than one maternal lineage and a significant maternal gene flow from wild populations after the initial domestication events. World buffalo population has reached to 130 million **(FAO STAT, 2005).** There are 22 breeds of the river type water buffalo known including Mediterranean and Egyptian buffalo **(Moioli & Borghese, 2005).**

Water buffaloes were introduced to Europe from India to Italy they were introduced about the 600 years and is called *Mediterranean Italian breed.* This type of buffalo is also of small size yielding 1400-1500 liters milk per lactation. Italian buffalo cheese is very much liked by the European people **(Moioli et al., 2000).** There has been little exchange of breeding buffaloes among countries; therefore each population has its own phenotypic features and performances (**Khan, et al., 2011**).

Buffaloes contribute 72 million tons of milk and three million tons of meat annually to world food, much of it in areas that are prone to nutritional imbalances. Water buffalo milk presents physicochemical features different from that of other ruminant species, such as a higher content of fatty acids

and proteins (**Cockrill, 1977 and Ambrosio**, ***et al.*, 2008**). Water buffalo milk contains higher levels of total solids, crude protein, fat, calcium, phosphorus and slightly higher content of lactose compared with those of cow milk. The high level of total solids makes water buffalo milk ideal for processing into a large variety of dairy products **(Tanaka, 1996 and Borghese, 2005**).

According to international ranking Egypt ranked number 4th (2.55 tons/y) in buffalo milk production but Italy ranked number 7th (0.125 tons /y) buffalo milk producing country with only seven thousand tons of milk production (**FAO STAT, 2005)**. Average lactation length ranged from 252 to 270 days. As a result of these factors the productive life of a buffalo is only 39% of its total life (**Ganguli, 1981 and Singh & Barwal 2010).**

Important management factors in improving milk production are managing nutritional status around calving, pre- and post-partum hygiene, good milking management, disease control, balanced feeding, managing thermal stress and improving housing **(Scherf, 2000**).

The major pathogens can cause mastitis, with changes in milk composition, very high increase in somatic cell counts (SCC), and leading to large economic losses. Infections with pathogens can lead to inflammation of the mammary gland and increased SCC lead to changes in milk composition, greatly reduced milk yield or clinical mastitis **(Terzano et al., 2007).**

The Italian Buffalo is the first in the world with regard to genetics, applied technologies, the monitoring of pathologies and the hygiene and quality of products. Therefore we need to study the comparison between the immune status of the Egyptian buffaloes and Egyptian-Italian buffaloes under the Egyptain environment.

2. Materials & Methods:

1- Milk Samples:

A total of 70 milk samples (35 milk samples from Egyptian buffaloes and 35 milk samples from Egyptain-Italian buffaloes) collected from dairy buffalo farms Egypt through the period from January to December 2014 used for the evaluation. Each milk sample was collected in clean, sterile and dry McCartney glasses in duplicate. One sample was examined for California mastitis test (CMT) and somatic cell count (SCC). The other sample was used in measurements of milk constituent by using infra milk analyzer 150, from Bentley. Studies were included total milk yield (TMY), lactation period (L), percent of protein and fats in milk also calculated the present of lysozymes and nitric oxide to measure the immune status. The data were analyzed using **SAS (2002).**

2- California Mastitis Test (CMT):

According to **APHA (1992)** for detection of mastitic cases in buffaloes, CMT was performed on individual milk samples collected from each half udder of every dairy buffaloes to detect mastitic cases. All samples were assigned to 3 categories: negative or positive reaction in 2 grades (++ & +++).

3- Measurement of Somatic Cell Count (SCC):

It was estimated automatically using Soma- Count 150, from Bentley. The SCC measures the number of white blood cells and udder squamous epithelial cells in milk that were present in large number in case of mastitis.

4- Measurement of Nitric oxide:

It was done as described by **Rajaraman et al. (1988).**

5- Measurement of lysozyme:

It was measurement of its activity by using agarose gel cell lysis assay according to the method described by **Schultz (1987).**

3. Results and Discussion:

The buffalo (*Bubalus bubalis*) population in the world is actually about 168 million head: 161 million can be found in Asia (95.83 %); 3 717 million are in Africa, almost entirely in Egypt (2.24 %); 3.3 million (1.96 %) in South America, 40 000 in Australia (0.02 %); 500 000 in Europe (0.30 %) (Antonio and Marco, 2005).

Italian buffalo numbers have increased due to the demand for particular products obtained only from buffalo milk and because the buffalo has changed from a rustic triple purpose animal to become a dairy purpose animal. In Italy particularly the increasing demand for buffalo mozzarella cheese both on the national and international markets (Fooda, *et al*., 2009).

In this study we recorded comparison of milk production between Egyptain buffalo and Egyptain-Italian buffaloes; age of first calving was 32 months in Egyptain buffaloes while in Egyptain- Italian buffaloes were 28 month. The lactation period was 257 days in Egyptain buffaloes while in Egyptain- Italian buffaloes were 281 days. Also, the average milk/day was 7-8liters/day for Egyptain buffaloes but in Egyptain-Italian buffaloes recorded 12-14 liters/day. All these findings agree with El-Menshawy (1994) (Table, 1).

The prevalence of mastitic cases in lactation season was recorded highest rates in Egyptain buffaloes about 10 cases (14.29%) with 3 cases return after treatment with antibiotic while in Egyptain-Italian buffaloes were 2 cases (2.86%) and completely cure after treatment. Also we recorded 3 cases (4.29%) suffer from diarrhea with clinical symptoms in Egyptain buffaloes only. The obtained data was agreed with the data obtained by Fooda *et al.,* (2010) (Table, 1).

The biggest difference between buffalo milk and milk of other species is the fat. Both the content and the fatty acid composition differ. Buffalo milk contains lower levels of phospholipids and cholesterol and the fat have a higher proportion of saturated fatty acids which leads to a higher melting point (Sheikh, *et al.,* 2006). In this study, protein contents were significantly higher (P<0.05) in Egyptain-Italian buffaloes (4.16± 0.22%)

Compared with Egyptain buffaloes (3.69±0.14%) there is significant difference between them (Table, 2). The fat percent in Egyptain buffaloes was 5.48±0.31gm while in Egyptian-Italian buffaloes were 9.23±0.40 gm. These finding was agreed with Kotby *et al.* (1989) (Table, 2).

The high milk solids of Buffalo milk not only make it ideal for processing into superb dairy products but also contribute to significant energy savings in conducting that process. In this study lactose percent was 5.13 ±0.28 mg% in Egyptain buffaloes while recorded 5.7 ± 0.27

Mg% in Egyptian-Italian buffaloes. Also the percent of SNF was 9.25±0.4mg% in Egyptain buffaloes while recorded 10. 75±-0.51

Mg% in Egyptian-Italian buffaloes. These findings were agreed with Fahimuddin (1989) (Table 2).

But the percent of salt recorded 70 – 75 IU in Egyptain buffaloes while recorded 8 – 9.5 IU in Egyptian-Italian buffaloes. The incidence of clinical mastitis in buffalo ranges from 8 to 40% (Roth & Myers, 2004). SCC in normal buffalo milk varied from 50×10^3 to 75×10^3/ml while in this study SCC was much higher 130 x 10^3 to 170 x 10^3/ml in Egyptain buffalo milk than 100 x 10^3 to 120 x 10^3/ ml in Egyptain-Italian buffalo milk. Although intramammary infections are single most important factor for increase in SCC. There was significant difference (P<0.05) in the somatic cell count.

Table (3) show that Egyptain buffaloes recorded significant elevation in lysozymes in compare with 262.4 ± 81. 8 while recorded 188.8 ±67.5 in Egyptain-Italian buffaloes. Meanwhile, Egyptian- Italian buffaloes 198 ± 30.2 of elucidate significant increase in nitric oxide activity in compare with Egyptain buffaloes 182.21 ±41.5. These results agreed with Ahmad, *et al.*, (2008).

It can be concluded that from the results obtained slight increase in milk productivity was noticed due to crossbreeding with the Italian buffaloes.

Paying more attention to the genetic improvement of the Egyptian buffalo is quite likely to improve its productive performance using Italian buffalo for improving the national milk production from buffalo. There is still need for milk composition analysis and the reproductive performance for the crossbred populations under local conditions. More studies are needed for the productive, reproductive and genetic diversity of crossbred populations before enhancement of crossbreeding activities on national level.

Table 1: Comparison of milk production between Egyptain buffalo and Egyptain- Italian buffaloes

Traits	Egyptain buffaloes	Egyptain- Italian buffaloes
Age at first calving/month	32 month	28 month
Lactation period (days)	257 days	281 days
Average milk /day (liters)	7-8 liters/day	12-14 liters/day
Mastitic cases/ season	10 (14.29%)	2 (2.86%)
Clinical cases(diarrhea)	3 (8.57%)	--

Table 2: Comparison of milk constituent of Egyptain buffalo and Egyptain- Italian buffaloes.

Constituents	Egyptain buffaloes*	Egyptain- Italian buffaloes*
Protein (gm./100gm)	3.69±0.14	4.16± 0.22*
Fat (gm. /100 gm.)	5.48±0.31	9.23±0.40*
Lactose; gm./100gm	5.13 ±0.28	5. 8 ± 0.27
SNF (mg/100gm)	9.25±0.4	10. 75±-0.51*

* Means are significant at p< 0.05.

Table 3: The comparison of the measurement of lysozymes & nitric oxide production in milk between Egyptain buffalo and Egyptain- Italian buffaloes.

Immune- status Test	Egyptain buffaloes	Egyptain- Italian buffaloes
- lysozymes	262.4 ± 81. 8*	188. 8 ±67.5
- Nitric oxide	182.21 ±41.5	198 ± 30.2*

Means carrying different superscripts (small litters) within rows are significant at p<0.05.
Means carrying different superscripts (capital litters) within rows are significant at p<0.05.

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