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Effects of External Parasites on the Productivity of Poultry in the Traditional Rearing System in the Sub-humid Zone of Burkina Faso

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Abstract: This study was designed to identify the external parasites and to evaluate their effects on mortality, growth and reproduction of poultry in the traditional rearing system in the sub-humid zone of Burkina Faso. Identification of external parasites was done on 500 of each species of chicken, guinea fowls and turkeys. For the evaluation of the effects of external parasites on the productivity of poultry, 324 chicks that were 6 weeks of age were randomly divided into 12 groups of 27 chicks each. Four of the groups was assigned at random to receive a treatment against external parasites (ET), 4 other groups were similarly assigned to receive a treatment against external parasites and another treatment against internal parasites (EIT). The 4 remaining groups were not treated against parasites (NT). Two mice species *Liperus gallinae* and *Monopon gallinae* have been found on both chicken and turkeys while *Goniodes gigas* was the only mice species parasiting chicken. The lice *Echidnophaga gallinacea* and the tick *Argas persicus* have been found to parasite chicken. Results of productivity trial showed that mortality due to effects of external parasites amounted to 13.9% of non treated poultry. Live weight of male birds increased from the base line of 850 g of the non-treated birds by 9.8% (950±164.3 g) due to treatment against external parasites and by 44.5% (1250±133.1g) due to treatments against both external and internal parasites. Live weight of female birds increased similarly from 952.5±238.7 g by only 3.8% (980.5±36.2 g) due to treatment against external parasites and then by 13.5% (1081.6±160.2 g) due to treatment against both external and internal parasites. Likewise, age at first egg decreased from 28 weeks to 25 weeks with treatment against external parasites and further to 24 weeks with both treatments. Egg weight also increased from 47 to 48.0g due to treatment against external parasites and further to 48.5g due to both treatments. External parasites increase mortality rate and reduce growth rate of chicken.

Key words: Poultry, external parasites, live weight, mortality, mite, lice

INTRODUCTION

Burkina Faso is an agriculture-and-cattle-breeding-based economy country. These activities provide more than 30% of GDP and 80% of exports (Kondombo, 2007). As part of the breeding activity, poultry production plays an important role in food security and is an easy sustainable livelihood (CILSS *et al*., 2006; MRA, 2005).

One of the big constraints facing poultry breeding activity in rural areas is the health issue (Grundler *et al*., 1988). Indeed traditionally bred fowl are frequently infested with ectoparasites because of bad lodging conditions. Bonofoh *et al*. (2000) reported for the case of the Gambia that 6 ecto-parasites species, *Argas persicus*, *Amblyomma macultum*, *Menopon gallinae*, *Cnemidocoptes mutans*, *Pulex irritans* and *Lipeurus caponis* were present on fowl at a rate of 49.5%.

Ectoparasites cause fowl to experience stress and lead to a lot of serious diseases (Sangare, 2005). Yet, in Burkina Faso, no research on fowl has assessed the effects of external parasites infestations on the productivity of poultry.

The objectives of the study were to identify the external parasites of fowl in Burkina Faso and to assess their effects on the productivity of traditionally reared poultry.

MATERIALS AND METHODS

Part I: The identification of the parasites

The research area: The study was carried out in Samagan, a village some 10 km away from Bobo-Dioulasso. At the time of this study, the climate conditions in this locality were characterized by a dry and cool season from October to November and a hot season going from March to June. According to data provided by Environmental and Agricultural Research Station in Bobo Dioulasso, for the last decade, the rainfall averaged 977.98±195 mm, with an annual temperature of 26.4±2.5°C, an annual average of 64.3±13.5% relative humidity.

Animal material: It included hens, guinea hens, turkeys and the area of study.

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Collection of ectoparasites: Ectoparasites were collected during the following three periods: September (wet weather), December (cool and dry weather) and April (dry and hot weather). For the collection of feathers-infesting parasites, feathers were sampled on the back, the tail, the wings and the head. Samples were then put in plastic bags and stored in a freezer. Ticks were collected at the base part of the feathers and stored frozen. Pennas were collected using a pair of pliers.

For the collection of skin infesting parasites, the fowl were first spread with an insecticide and then shaken on a white paper. Dead parasites that fell down were then collected and sorted out depending on morphology, with the help of the lenses of a binocular.

The hematophagic parasites sticking on fowl head and skin were simply captured using a pair of pliers.

The collected ectoparasites were then put in flasks containing a 70° alcohol. Flasks were then marked with the species name, the part of collection on the body also the location of the fowl.

Identification of ectoparasites: The parasites were placed between slide and cover glass and then examined with a binocular magnifying glass equipped with a photo camera. Snapshots were then computer-processed for a morphological observation and classification of gathered ectoparasites using identification codes.

The identification code of the orders of adult insects (Borror and White, 1970) describes fowl ectoparasites as wingless insects with a rib cage and abdomen visible from the back side. Within this code:

- Insects with a compressed body like an up standing book fall in the category of syphonapteres.
- Those with a flattened body on both the belly and the back sides like an open book unto a table with a head wider than the thorax and mouth pieces of a grinding type fall in the category of mallophages.

One illustrative code of the syphonapteres family (Klein, 1979) has allowed the identification of the *pullicidae* type: hind coaxes with a row of spine-like bristles on the internal side: sensilium with 14 sensory dimples on each side.

A classification code of mallophagic parasites was used to determine the different taxons. Ticks were identified using family and type's identification codes of Lamontellerie (1963) as been part of:

- The *argasidae* family: no dorsal scutum*, no ambulacra, gathered rostrum, leather-like integuments, slight sex dimorphism and then to
- The *Argas* type: thin lateral sides, a neat separation between back and belly sides, with an elongated and oval-shaped body, usually shrinking upward and always eyeless.

Part II: Poultry productivity parameters.

Habitat and breeding equipment: The habitats had interior rough casted walls, rammed floor and sheet metal roof. The dimensions allowed regular cleaning up and disinfections. The breeding equipment was made up of salvaged materials (broken jug, calabashes and plates). For feeding, feed is thrown on the floor.

Animals and allotment: All the individuals used for the experiment were chicks resulting from cross-breeding between local hen breed and ISA Brown breed cocks. They were kept in brooding house until 6 weeks of age. After 6 weeks, 324 chicks were weighed and marked with identification rings and randomly assigned to one of 3 groups of 108 chicks. Each group was assigned to one of the 3 observational treatments. The first treatment (ET) consisted of an external disinfections; the second treatment (EIT) an external disinfection coupled with an internal one; the third treatment (NT) consisted in no intervention. Within each group, the chicks were randomly separated into 4 sub-groups of 27 each; each of the 12 experimental sub-groups were then entrusted with a village breeder. Weigh supervision was carried out every other two weeks.

All the groups of chicks were made to undergo a vaccination protocol (1st day, 3rd week, 2nd month) against Newcastle disease with Ita-new vaccine.

The external disinfectant used against dust mites and lice is made of an emulsifiable solution containing deltamethrin. External disinfection was carried out every four weeks.

The internal disinfectant used against adult forms of helminthes is a polyvalent vitamin-enriched anthelmintic composed of niclosamide (80 mg), levamisole chlorhydrate (20 mg) and vitamin A (30 UI) per kg of live weight. The 1st treatment was administered to all chicks after 15 days of age while still in the brooder house, the 2nd one occurred 60 days later and the 3rd one 15 days later, aimed at killing the existing parasites that were still in larva form and which have reached the adult stage. The 4th treatment occurred 3 months later with 1/4 of the normal dosage, the 5th after 6 months of age.

Measured parameters: Measured parameters included mortality, weigh gain, the beginning of reproductive life and eggs weight.

Statistical analysis: Collected quantitative data were analyzed for variance using the SAS (Statistical Analysis System, 1984) software by applying the General Linear Model (GLM). Means were separated with Duncan's Multiple Range Test (DMRT) method.

RESULTS

The identification of ectoparasites: The ectoparasites discovered on the fowl consisted mainly of insects and arachnids.

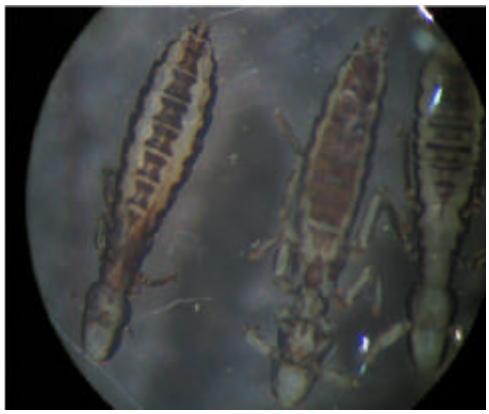

Photo 1: Female of *Lipeurus caponis*

Photo 2: *Echidnophaga gallinacea*

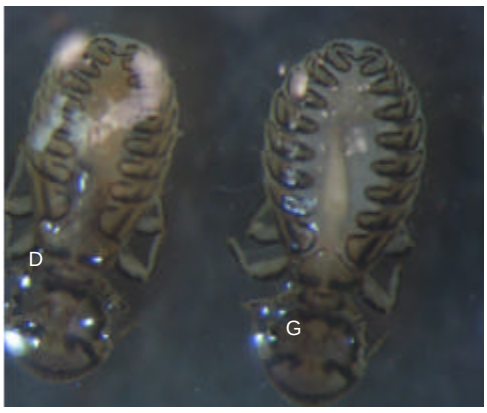

Photo 3: *Goniodes gigas*: male (G) and female (D)

Chicken were found with 3 types of ectoparasites classified as mallophagic lice, fleas or ticks (see photo 1-5). Lice included 3 different species namely the *Goniodes gigas*, *Liperus caponis* and *Menopon gallinae*. Ticks consisted of only one species, the *Argas persicus*, which were still in the larva stage on the chicken. Fleas fall in the category of *Echidnophaga gallinacae*.
Turkey was plagued with only 2 species of mallophagic lice, *Liperus caponis* and *Menopon gallinae* identical to the ones found on chicken.

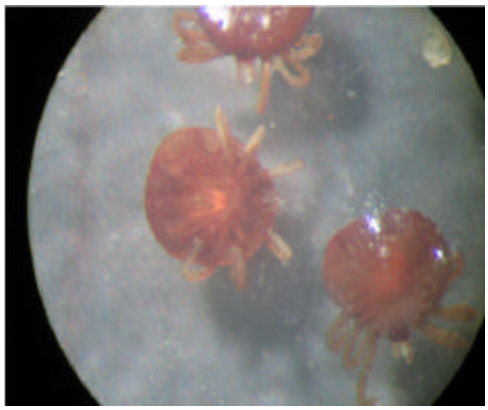

Photo 4: *Argas persicus* larvae

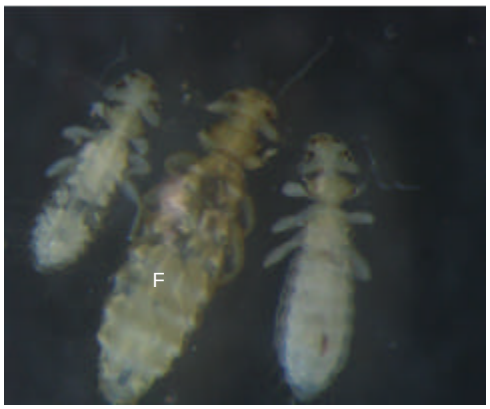

Photo 5: *Menopon gallinae:* female (F) and males

Table 1: Taxonomy of fowl tick soft larva in Samagan

Branch	Arthropoda
Sub-branch	Chelicerata
Class	Arachinida
Order	Acari
Sub-order	Ixodida
Group	Argasidae
Type	Argas
Species	Persicus

Guinea fowls were found infested only with *Argas* larvae (*Argas persicus*). It is during the rainy season and wet time that these parasites were found on the heads and wings of guinea fowls. Out of 500 guinea fowls put under scrutiny, a total number of 21 belonging to 8 different breeders were found with these parasites. No other parasites were found on guinea fowls during the other seasons.

Classification of the ectoparasites: The adult ectoparasites found in the Samagan area belong to the category of insects. The tick soft larva (*Argas persicus*) was the only dust mite found on fowl.
Table 1 shows the taxonomy of the soft larva known as *Argas persicus*.

Table 2: Taxonomy of fowl lice in Samagan

Branch	Arthropoda	Arthropoda	Arthropoda
Sub-branch	Hexapoda	Hexapoda	Hexapoda
Class	Insectica	Insectica	Insectica
Order	Phthiraptera	Phthiraptera	Phthiraptera
Sub-order	Ischnocera	Ischnocera	Ischnocera
Group	Phylopteridae	Phylopteridae	Phylopteridae
Type	Liperus	Goniodes	Menopon
Species	Caponis[1]	Gigas[2]	Gallinae[1]

[1]Common to chicken and turkey. [2]Specific to chicken

Table 3: Taxonomy of chicken flea in Samagan

Branch	Arthropoda
Sub-branch	Hexapodia
Class	Insectica
Order	Siphonaptera
Sub-order	
Group	Pulicidae
Type	Echidnophaga
Species	Gallinacea

Table 4: Mortality and cause of chickens' mortality

Treatment	CM	No. of deaths	Total	MR (%)
ET	Predation	20	108	18.50
	Accidents	07		6.48
EIT	Predation	13	108	12.34
	Typhos	16		14.81
NT	Predation	27	108	22.69
	Smallpox	24		22.22
	Typhos	05		4.93
	Ectoparasites	15		13.9
Total		127	324	39.20

CM = Causes of Mortality; MR = Mortality Rate (%)

Table 2 shows the taxonomy of the 3 types of lice found on fowl in Samagan:*Liperus caponis*, *Goniodes gigas* and *Menopon gallinae*.

Table 3 shows the taxonomy of the sole type of louse found on chicken, *Echidnophaga gallinacean*.

The effects of ectoparasites on chickens

Chickens mortality: Table 4 shows the rates and causes of mortality in the population of fowl under study. The overall rate of mortality amounts to 39.19%. The effect of ectoparasites was marked (up to 13.9%) on control groups (NT) between the 6th and the 10th week of age. Amongst the other populations, none of the recorded mortality was caused by ectoparasites. Out of a total number of 127 chickens which died, the origins of the losses were predation (47.4%), accidents (5.3%), diseases (35.8%) and ectoparasites effects of (11.6%).

Chickens weight gain

Cockerels' live weight: Figure 1 shows the evolution of the Average Live Weight (ALW) of cockerels in accordance with treatment during the first 8 weeks of treatments.

It was noteworthy that up to the 14th week, no effect of disinfections was noticeable.

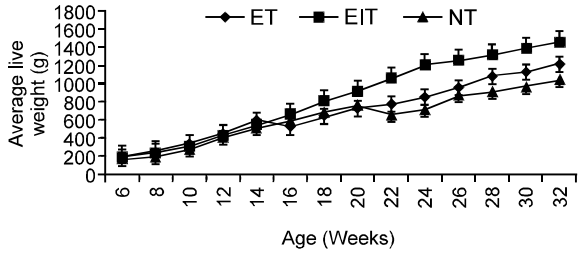

Fig. 1: Evolution of average live weight of cockerels in accordance with treatments

External disinfections had an effect on the evolution of ALW only from the 22nd week. Weights at 26 weeks of age are presented in Table 5. The ALW of the ET and EIT males were respectively higher by 9.8 and 44.5% than that of the non-treated male (865.1±372g).

From the 6th to the 32nd week, the pattern of weight increases was linear with a higher increase rate due to each of the 2 types of disinfections (EIT) in comparison to the absence of disinfections (NT), the increase rate being more noticeable with the combination of the 2 types of disinfections.

Pullets' live weight: The same tendencies were observed on young pullets except that no effect was noticeable because of sole external disinfections (ET).

Figure 2 shows the evolution of the live weight of young pullets depending on treatments. Throughout the whole experiment females submitted to both external and internal disinfection (EIT) had a noticeably improved average live weigh. Weights at 26 weeks (Table 5) averaged 1081.6±36.2g for EIT pullets but were relatively lower, 988.5±36.2g and 952.5±238.7g respectively for pullets on external parasite treatment (ET) and non treated pullets (NT).

Cost of treatments: During the study, the cost of internal disinfection was 90 FCFA per cockerel and 70F CFA per young hen. During the same period the external disinfection cost 58.33 F CFA per chicken.

The combination of the two treatments amounts to 148.33F CFA per cockerel and 128.33 FCFA per young hen (Table 5).

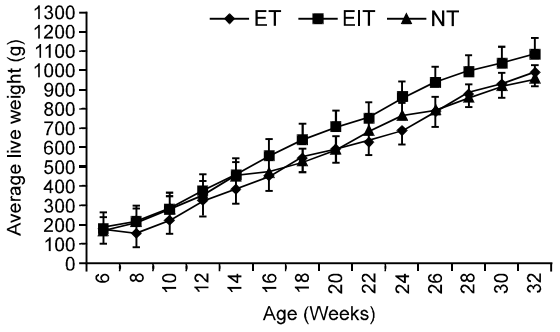

Fig. 2: Evolution of average live weight of pullets in accordance with treatments

Table 5: Evolution of live weight and costs of treatments of cockerels and pullets

Sex	NT[1]	ET[2]	EIT[3]
	---------- Live weight, g ----------		
Cockerels	865±372.0	950±164.0	1250±133.1
Pullets	952.5±36.2	988.5±238.7	1080±36.2
Cost of treatment, CFA franc			
	---------- External parasites ----------		
Cockerels	0	58.33	58.33
Pullets	0	58.33	58.33
	---------- Internal parasites ----------		
Cockerels	0	0	90
Pullets	0	0	70
Total cost of treatment, CFA franc			
Cockerels	0	58.33	148.33
Pullets	0	58.33	128.33
Selling price, CFA franc			
Cockerels	1297.50	1425.00	1875.00
Pullets	1428.0	1482.75	1621.50

[1]NT: No treatment
[2]ET: Treatment against external parasites
[3]EIT: Treatment against external and internal parasites

Table 6: Onset of reproductive life of cockerels and pullets

	NT[1]	ET[2]	EIT[3]
Cockerels			
Age at first crow, weeks	28	25	24
Pullets			
Age at first egg, weeks	28	25	24
First laying cycle			
Length, days	14	16	17
Number of eggs	10	14	15
Egg weight, g	47.0±0.5	48.0±0.3	48.5±0.2
Rate of lay, %	71.4	87.5	88.2

[1]NT: No treatment
[2]ET: Treatment against external parasites
[3]EIT: Treatment against external and internal parasites

Beginning of reproductive age: Sorting chicks by sex occurred only after 3 months of age. Males coming from populations submitted to both external and internal disinfections (EIT) were the first to produce their first crow at an average age of 24 weeks, followed by males submitted to only external disinfections (ET), at an average age of 25 weeks. Coming last were males from the control groups (NT), at 28 weeks (Table 6).

As a result, the first hens to lay eggs came from the groups which underwent both an external and internal disinfections (EIT) that is at 24 weeks of age. Females from the group that underwent external disinfection (ET) laid their first eggs 1 week later (25 weeks). Lastly, females from control groups (NT) laid their first eggs 2 weeks later at an average age of 28 weeks.

The first egg laying cycle per hen lasted in average 17 days for the non treated group but was reduced to an average of 16 days with external treatment and further to 14 days with both treatments.

Egg number averaged 10 with the non treated group but increased by an average of 4 with deworming and further by an average of 5 when both treatments were applied.

The laying rate calculated for the non treated group was 71.4%; corresponding increase rates were 22.5 and 23.5% respectively due to deworming alone and to the application of both treatments.

Egg weighing 47±0.5 g for the non treated group were found heavier by 1.0 g due to deworming alone and by 1.5 g due the combination of both treatments.

The ages at which the first crow appeared in cockerels and at which the first egg was laid by the hens were identical: 28 weeks for the control group but reduced to 24 weeks thanks to the 2 types of disinfections.

DISCUSSION

Distribution of the groups of ectoparasites on the poultry: The groups of ectoparasites are found on the different parts of the body of the chicken and turkey.

Echidnophaga gallinae is a louse stunk at the hen at the level of the head (cockscomb, wattles and eyelids). It is an insect jumper, which is common in tropical area (Bussieras and Chermette, 1991). This ecoparasite is a bloodsucker which remains stuck for 1 to 3 weeks on the adult chicken. This parasite is intermittent (Villate, 2001a,b). One louse specie, *ceratophilus gallinae* or European louse, remains on its host only for the time of its meal.

The Mallophage lice, *Liperus caponis*, *Goniodes gigas* and *Menopon gallinae* are on the feathers. They feed on the barbs and barbules of the feathers. The mallophagas lice are the ectoparasites that are most found on the chicken and the turkey. These insects spend all their biological cycle on the body of the poultry and that explains their permanent presence on the bird. The mallophagas lice multiply often at such a rate that the body of birds is invaded by thousands of parasites so that the hen completely lose rest and sleep; the mallophagas lice on an infected bird can, according to our observations, represent 99% of the parasites present on the body of the bird. The brooding hens that are infected leave their nest causing the lost of the hatch (Larrat *et al*., 1971).

The *Argas persicus* ticks feed at night time. The meal composed of blood is taken very fast, generally less than

20 mn (Sonenshine, 1991; Hillyard, 1996) and the sticking can be painful. The *argasidae* have a high longevity and can resist fasting for 5 to 6 years (Brumpt and Brumpt, 1967); their suckling act can induce particularly to young birds an anaemia and a paralysis that is provoked by toxins. They also have an indirect pathogenic power because, as biting mites, they are potentially vectors of germs, viruses, parasites and even worms.

The *Argas* larva can feed for 10 days on their hosts. Apart from the larval stages, the *Argasidae* can take up to 10 meals per day (Socolovschi *et al*., 2008). The *Argas persicus* larvae are essentially found under the feathers at the level of the skin; it is wrongly called "red louse" in Burkina Faso because the *Argas persicus* is rather an acarian, a soft tick but not an insect. It is so called, because it is only at larval stage that it becomes parasite of poultry, but it is hexapod as any insect. However, the presence of rostrum permits to differentiate insects from acarians. The first are Mandibulata and the acarians are Chilicerata (Beaumont and Cassier, 1983).

These ectoparasites are bloodsuckers. The adults come out at night time and parasitize poultry only during the blood meal time. In the environment of the peasants, poultry houses are generally hastily made with small doors and windows that seldom permit a person to enter in them for cleaning and observation. The walls may have cracks that become shelters for the adult ticks at day time. At night, these parasites leave their hiding and reach the floor for their blood meal. Rural breeders appreciate this phenomenon badly because they nearly do not see them and even ignore them. Yet, the *Argas persicus* is known as a vector of spirochaetosis and of avian scabies. It's larva are not frequently met on the hen, but when they appear, they can feed for 10 days on their host (Sonenshine, 1991; Hillyard, 1996) and cause important damage that can be fatal to poultry, as no solution is offered to the farmers to kill them.

Producers and merchants of poultry explained the rarity of external parasites on the body of guinea fowl by the fact these birds spend the night on trees' branches (Sangare, 2005), so that they are less exposed than the chicken to the ectoparasites. It is then during the rainy season that the guinea fowl is exposed to be infected by the *Argas persicus* larva. The mallophagas lice are almost absent at the level of the guinea fowl except in case where this specie cohabits with other species of poultry in the same poultry yard.

In Africa, numerous species of Amblyomma feed on a large variety of hosts particularly on big mammals but also on rodents and birds (Socolovschi *et al*., 2008); they are exophilic ticks that live in the vegetation and parasitize poultry in the absence of their habitual hosts. However ecological differences between zones bring disparities about the parasitizing species between regions. In this sense *Amblyomma macultum*, *Cnemidocoptes mutans* and *Pulex irritans* were not encountered at Samagan while *Echidnophaga gallinae* and *Goniodes gigas* found at Samagan were not listed in the Gambian study (Bonofoh *et al*., 2000); meanwhile, *Menopon gallinae*, *Lipeurus caponis* and *Argas persicus* are found in the two studies.

About the mortality of the young hens: During the study, the global mortality rate of the chicks was 39.09%. Pathologic diagnosis showed on 11.6% of dead chicks (6-10 weeks) a heavy presence of external parasites. No other sign of avian pathology was revealed on these dead chicks during the diagnosis so that the ectoparasites have been considered responsible of those mortalities. A study conducted in North Guera, a region of the East-Center of Chad by Mopate *et al*. (1997) indicated an average mortality rate of 32.44% following the effects of ectoparasites on the local poultry. In the same way, Alamargot *et al*. (1985) had recorded a rate of 50-100% of mortality of chicks due to effects of external parasites in traditional breeding. These results are explained by the vulnerability of the chicks; they are more sensitive to the effects of the external parasites than the adults (Baud'Huin, 2003). The low rates of mortality recorded during our study are due to the fact that the chicks have been placed in chick brooding house up to the age of 6 weeks before being placed in traditional breeding. They resist better to the effects of ectoparasites at after this age. Indeed, beyond 6 weeks of age no mortality has been caused by external parasites.

Causes of poultry mortality between regions can vary according to level of management and also to ecological differences. Mortality rates due to the other causes namely the infectious diseases (36%), predation (47 %) and accidents (5%) are different from those reported by Kondombo (2007) for traditional breeding in the center region of Burkina Faso. These authors had recorded a mortality rate of 83% as due to sicknesses and only 10% to predators. Other sources indicate 56% of mortalities due to infectious diseases and 34% to ill-management (Dafwang, 1990; Bonfoh *et al*. (2000) in the traditional breeding system.

The low rate of mortality recorded during this study and due to sicknesses can be explained by the application of a sanitary protocol to the poultry during the first 6 weeks. The outbreak of avian pox in the month of November could be explained by the outbreak of insects at this period, as insects are vectors of avian pox virus. The high rate due to predation and accidents can be explained by the long distance walked by the hen in their search for insects and termites in the bushes and alongside the river crossing the village. Also, unlike the less vegetated region of the center of Burkina Faso, low visibility at sunset due to the dense vegetation in the

region of Samagan can also explain the increased frequency of poultry thefts and the higher incidences of poultry hit by bicycles, motorcycles and cars.
Lastly, the morbidities have entrained reductions in weight gains for the chickens at the 16th and the 22th week of age.

Average live weight: Considering weight gain, disinfections had an effect on the evolution of ALW only from the 22nd week because up to the 14th week, no effect of disinfections was noticeable. External parasites have a more pronounced improving effect on cockerels (9.8%) than on pullets (3.8%). Male having a faster weight gain than females manifested more the effects of disinfection against ectoparasites. Therefore, the effect of disinfection against ectoparasites is correlated significantly with the rate of weight gain at the level of the chicks. It would be possible that, in a breeding of broiler chickens in Burkina Faso, des-insectization will have a more significant benefit on broiler weight.

Costs of disinfections: The external and internal anti parasite coverage of a cockerel has been of 238.33 against 193.33 CFA for a young hen. The external one is 58.33 CFA for a young hen. The average live weight, at 32 weeks of age was 1368g for the cockerels and 1080g for the young hens.
The sale of the poultry yields was about 1200 to 2000 CFA. Additional sale prices obtained from external treatment alone revealed to be low as compared to the combination of both treatments, respectively + 127.50 vs. + 577.50 CFA in males and + 54.75 vs. 193.50 CFA in females. Internal and external disinfections are by far beneficial as the expenses on food are neglectable, as chicken glean the essential of their food in the nature. This benefit can increase by an adequate feeding of poultry in an improved breeding system as the anti parasite coverage alone cannot allow poultry to externalize all of its potentialities.

Onset of reproductive life: External parasite disinfection alone reduced the onset of reproductive live on both males and females by 3 weeks as compared to no treatment, respectively 25 vs. 28 weeks, but was less efficient than its combination with deworming (24 weeks). However external parasite disinfection alone was also a little less efficient than the combination treatment in improving the number of days of the first laying cycle (+ 1 vs. + 3 days), the number of eggs (+ 4 vs. + 5 eggs), the laying rate (+ 22.5 vs. + 23.5%) and average egg weight (+ 1 vs. + 1.5 g).
Compared to previous data obtained on poultry, the age of the beginning of laying was 26 weeks (Saunders, 1984) for local hens and 21 weeks for the modern egg laying strain (Buldgen *et al*., 1996) or respectively 2 and 7 weeks shorter than the age recorded for the non treated hens of this study. It appeared that the search for feed was more difficult for the hens of this experiment or more probably that crossing local poultry back with improved strain for laying reduced the capacity of the resulting chicks to adapt to the less improved conditions of the village rearing system.

Conclusion: This study showed that treatment against external parasites is beneficial on the productivity of poultry in the traditional rearing system of rearing. Benefits are more noticeable if treatment starts before the chicks reach 2 months of age and particularly when treatment against internal worms is also applied.

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