

Full Length Research Paper

Comparison of growth and reproductive performance of exotic, indigenous and cross breeds of pigs in Nepal

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Accepted 10 March, 2019

The objective of this study is to evaluate growth and reproductive performance of the exotic, indigenous and cross breeds of pigs in Nepal. A total of 42 female piglets were selected, 7 each from breed in Hampshire, Pakhribas black, Nagpuri, Hurrah, Pakhribas black X Nagpuri and Hampshire X Hurrah; and are kept under 6 treatments with 7 replications. Mean body weight, age at first mating, litter size at weaning, litter weight at weaning and farrowing interval were significant ($p < 0.05\%$). Weight at first mating and litter index sow/year were significant ($p < 0.01$). Age of first farrowing, litter size at birth, weight of piglets at birth and piglet mortality % were non significant. Exotic breed Hampshire has the highest adult body weight than synthetic breed Pakhribas followed by cross breed Pakhribas X Nagpuri, Hampshire X Hurrah and local breeds Nagpuri and Hurrah. Age at first mating, age at first farrowing and piglet mortality % were higher in local breeds. Litter size at birth, litter size at weaning and weight of piglets at birth were higher in Pakhribas. Weight at first mating and litter weight at weaning were higher in exotic breed. Farrowing interval was higher in local breed. Litter index was higher in synthetic and exotic breeds.

Keywords: Exotic, indigenous, cross, breed, farrowing, growth, reproductive, pig.

INTRODUCTION

Pig is a high value domesticated animal for meat as it gives quick return to the farmers by consuming waste food materials converting into valuable protein. The government through department of livestock services (DLS) and different NGO/INGOs have been distributing improved pig breeds in the country for many years. This approach has expanded the improved pig raising system in the rural farmers. Regional Agriculture Research Station (RARS), Tarahara, Sunsari, Nepal has been conserving different pig breeds viz. Hampshire, Pakhribas Black, Hurrah, Nagpuri and their crosses for many years. The exotic and improved breeds maintained

as pure line parental (nucleus) seed stock. Hurrah and Nagpuri kept as conservation of native pig breeds and crossing each other for research purposes.

MATERIALS AND METHODS

A total of forty two female piglets (Hampshire $n=7$, Pakhribas black $n=7$, Nagpuri $n=7$, Hurrah $n=7$, Pakhribas black X Nagpuri $n=7$ and Hampshire X Hurrah $n=7$) were kept under 6 treatments with 7 replications one pig considering as one replication. A study was conducted in Regional Agricultural Research Station (RARS), Tarahara, Sunsari, Nepal. The data for the present investigation were obtained from the pigs of exotic, indigenous and cross breeds of Nepal over a period of 1 year from July 2017 to June 2018. The design used was CRD. Providing commercial feed upto twelve months

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of age, drenching and vaccination were routinely done in each pig. Piglets from different groups were kept in indoor housing system with open running space under uniform management condition. Data were analyzed using MSTAT. The observations were recorded from pedigree sheet of pig farm. Mean body weight (kg) and other performance parameters like age at first mating (days), weight at first mating (kg), age at first farrowing (days), litter size at birth (nos.), weight of piglets at birth (kg), litter size at weaning (nos.), litter weight at weaning (kg), farrowing interval (days), litter index /sow/year, piglet mortality % were compared.

LITERATURE REVIEW

Nepalese farmers are nowadays raising various types of exotic breeds such as Landrace, Hampshire, Duroc, Yorkshire, etc. although Chwanche, Hurrah and Nagpuri etc. are the indigenous breeds of pig which are the major component of livelihood for most of the deprived communities.

Pakhribas pig is a result of three-way crossing of exotic breeds (Saddle back, Fayuen and Tamworth) developed at Agricultural Research Station (ARS), Pakhribas (Oli 1986, Gatenby et al., 1990, Aryal et al., 1992). The breed is very popular in the eastern hills of Nepal because of its black color and a good litter size at birth and weaning (Gatenby et al., 1990). For religious purposes, black color is preferred over other colors in the eastern hills. It is medium in size and can be maintained by the farmers in the hills.

Hurrah pigs are distributed in southern terai belt of Nepal from east to west. The actual population of the Hurrah breed is unknown at present but it was estimated that it constituted 23% of the total native pig population. They are rust brown in color, hardy and suitable for scavenging conditions. They reach puberty at an average age of 11 months, first farrowing at 14 months with average litter size 7 at birth and 6 at weaning. The average birth weight is 0.8kg and adult weight is 45kg (40-55kg). They have been characterized at phenotypic and genotypic level. Their population is declining day by day and needs conservation measures. NARC records (Neupane and Kadel 2008) show that hurrah pigs attained an average of 42kg body weight at one year of age with a body length 79 cm; 88 cm heart girth; 7 and 5.7 litter size at birth and at weaning respectively, with less than 6 months farrowing interval. According to Dhakal (2012), Pokhrel (2012), Pandey (2011) and Thapa (2009) least square mean and standard error of reproductive traits like age at first service (days), age at first farrowing (days), farrowing interval, litter size at birth (nos.) and litter size at weaning (nos.) were 241.73±2.13, 351.30±4.8, 180.30±0.3, 8.70±0.27 and 7.53±0.20 respectively.

Nagpuri or Pundi breed is found in eastern hills and terai districts of Nepal. They are black in color, short snout, wrinkled face and pendulous belly that resembles

Chinese Mehisana breed. Some believe that the breed is crosses between the Chinese Mehisana and local pig breeds which have been well established since long before but it is placed in local breed category in Nepal. They are prolific with average weight of 40-50kg. Under good management condition, the breed has potential to reach adult weight of about 70kg. The farmers of economically disadvantaged and some middle class farmers rear Pundi (Dhaubadhel and Ghimire, 2002). This breed is said to have evolved from the crosses of Meshain with local pig population. According to Dhakal (2012), Pokhrel (2012), Pandey (2011) and Thapa (2009) least square mean and standard error of reproductive traits like age at first service, age at first farrowing, farrowing interval, litter size at birth and litter size at weaning were 213.5±11.14 days, 335.54±9.91days, 170.96±7.28 days, 8.95±2.39 nos. and 8.14±2.10 nos respectively.

Hampshire breed having large body size, short legs and small erect ears originated from England. They are black in color with white color belt encircling the shoulder and forelegs. This breed is suitable for crossbreeding and has been very popular in eastern region (Kayastha et al., 2014). Hampshire is popular for pork production. It is well known for excellent growth rate and feed efficiency. It matures early, farrows 8-10 litters and is a good mother. Mature boar weighs about 400kg and sow 350kg. According to Tummaruk et al. (2001) age at first farrowing and farrowing interval of Hampshire pig was found 386 days & 173.4 days respectively. Similarly, adult mean body weight was 185kg (Kumaresan et al., 2006). Likewise Thapa et al. (2018) who did research in production performance of crossbred pigs in government farm of Bhutan farrowing interval, age at first service, weaning to service interval, litter size at birth and litter size at weaning of Hampshire pig was 174 days, 301±42.42 days, 473 days, 11.77 days, 8.31 no. and 7.56 nos respectively.

RESULT

Growth performance of different pig breeds at RARS, Tarahara

Geometric means of body weight growth of different pig breeds at RARS, Tarahara has been presented in Table 1.

In the first and second month, the highest mean body weight was observed 8.9±1.12kg, 14.04±3.75kg in exotic breed Hampshire followed by 8.5±1.50kg, 12.44±1.72kg in Pakhribas (PAC) breed and the lowest 3.9±0.29kg, 6.73±0.68kg in local breed Hurrah. Similarly, on third, fourth, fifth and sixth months, the highest mean body weight was found 18.65±3.73kg, 23.24±4.28kg, 30.97±4.83kg & 39.08±4.50kg in Hampshire, Hampshire, Pakhribas × Nagpuri & Hampshire breeds respectively followed by 17.97

Table 1. Some production performances of indigenous breeds of pig (Mean±SD).

Traits	Hurrah	Chwanche	Bampudke	Pakhribas
Birth weight (kg)	0.8±0.08	0.7±0.06	0.6±0.08	1.05
Weaning weight	6.1±0.09	5.7±0.08	-	6.19±1.77
Age at first puberty (month)	10.8±0.99	7.3±0.85	6.2±0.12	-
Age at first farrowing (month)	14.0±0.96	10.7±0.80	11.5±0.23	364.2±7.4
Farrowing interval (month)	5.57±0.57	7.4±0.6	4.6±0.28	172.8±12.1
Gestation length (days)	114.5±0.66	114.8±0.52	-	113.5±1.84
Adult weight (kg)	45	35	20	350
Litter size at birth (nos.)	7.04±1.26	7.33±1.28	4.7±0.27	9.24±2.87
Litter size at weaning (nos.)	5.73±1.25	6.0±1.0	3.4±0.30	8.43±2.7

Source: Annual report, ABD (1997), Pradhan (1999), Neopane (2004), Neopane (2006), Neopane and Kadel (2008).

±3.37kg, 22.62±3.88kg, 28.62±4.20kg, 37.62±6.34kg in Pakhribas × Nagpuri, Pakhribas, Pakhribas, Pakhribas respectively and the lowest value was found 10.33±0.7kg, 14.33±0.57kg, 18.0±2.64kg, 21.33±3.21kg in local breed Hurrah.

Table 2 shows on 7th, 8th and 9th month, the highest mean body weight was observed 48.2±14.80kg, 66.0±15.78kg, 79.8±17.12kg in Hampshire followed by 48.12±7.16kg, 60.87±8.38kg, 70.62±7.0kg in Pakhribas and the lowest mean body weight was observed 26.16±2.24 kg, 31.33±2.51kg, 38.33±1.52kg in local breed Hurrah. Similarly, on 10th, 11th and 12th month, the highest mean body weight was observed 98.0±13.54kg, 115.25±17.37kg and 127.6±21.49kg in exotic breed Hampshire followed by 89.25±8.43kg, 108.87±9.03kg and 116.6±19.42kg in Pakhribas breed and the lowest mean body weight was observed 41.66±3.78kg, 49.0±4.32kg and 55.9±4.0kg in local breed Hurrah.

The result of this research revealed that the highest body weight was observed in exotic breed Hampshire followed by synthetic breed Pakhribas, Pakhribas × Nagpuri, Hampshire × Hurrah, Nagpuri and the lowest in Hurrah. Exotic breed like Hampshire has higher weight than synthetic breed Pakhribas, their crosses and local breeds.

The F-test statistics showed significant during 1st and 2nd month at 1% (p<0.01) level of significance whereas this test statistics showed significant during 3rd, 4th, 5th, 6th, 7th, 8th, 9th, 10th, 11th & 12th months at 5% (p<0.05%) level of significance.

Reproductive performance of different pig breeds at RARS, Tarahara

Geometric means of reproductive performance of different pig breeds at RARS, Tarahara has been presented in Table 3.

The highest mean of age at 1st mating & age at first farrowing were observed 335±26.8 days & 466±3.21days in Hurrah & Nagpuri breed respectively followed by 322±23.3 days & 462±5.59 days in Nagpuri & Hampshire breed respectively and the lowest 294±28.20 days &

408±6.9 days in Pakhribas breed. Similarly, the highest mean of weight at 1st mating and litter weight at weaning were observed 95±10.10kg & 9.2±0.28kg in Hampshire followed by 78±11.3kg & 8.1±0.75kg in Pakhribas and the lowest 52±9.75kg & 5.54±0.97kg in and Nagpuri & Hurrah respectively. Likewise, the highest mean value of litter size at birth & at weaning were observed 11.4±1.6 nos. & 9.4±1.01 nos. in Pakhribas followed by 10.5±0.59 nos. & 8.28±0.96 nos. in Hampshire and the lowest 7.56±1.32 nos. & 5.54±0.97 nos. in Hurrah.

Table 3 shows the highest mean of weight of piglets at birth, farrowing interval, litter index & piglet mortality were observed 1.2±0.05kg, 207±12.32 days, 1.8±0.24 sow/year & 22±0.96% in Hampshire, Nagpuri, Pakhribas & Nagpuri respectively followed by 1.1±0.08kg, 197±7.65 days, 1.8±0.05 sow/year & 21±0.85% in Pakhribas, Hurrah, Hampshire & Hurrah respectively and the lowest 0.92±0.87kg, 184±32.9 days, 1.5±0.98 sow/year, 18±7.57% in Hurrah, Pakhribas, Nagpuri & Pakhribas respectively.

Among overall coefficient of variance (CV), the CV of litter index (sow/year) was 4.95 which was least CV and significant at 1% level of significance. The least value of CV among them indicates that it was more consistent and reliable than other CV.

The F-test statistics showed significant in age at 1st mating, litter size at weaning, litter weight at weaning and farrowing interval at 5% (p<0.05%) level of significance. Similarly, this test statistics showed significant in weight at 1st mating and Litter index at 1% (p<0.01) level of significance whereas age of 1st farrowing, litter size at birth, weight of piglets at birth and piglet mortality showed non significant.

DISCUSSION

The mean body weight of Hampshire piglets in 1st month was found higher 8.9±1.12kg compared to 8.5±1.50kg, 4.38±0.57kg, 3.9±0.29kg, 5.93±0.66kg and 6.23±0.97kg of Pakhribas, Nagpuri, Hurrah, Hampshire X Hurrah and Pakhribas X Nagpuri piglets respectively. Similarly, the mean body weight of Hampshire piglets in 12th month was found higher 127±0.10kg as compared to 116.6±18.42kg,

Table 2. Mean body weight (kg) of different pig breeds upto age of 12 months.

Months	Pakhribas Mean±SD	Hampshire Mean±SD	Puri Mean±SD	Hurrah Mean±SD	Hampx Hurrah Mean±SD	PACxPuri Mean±SD	F- Test
1 st	8.5±1.50	8.9±1.12	4.38±0.57	3.9±0.29	5.98±0.66	6.29±0.97	*
2 nd	12.44±1.72	14.04±3.75	9.25±4.66	6.73±0.68	9.33±1.97	11.97±2.33	*
3 rd	17.29±2.28	18.65±3.73	14.08±4.82	10.33±0.7	14.93±2.0	17.97±3.37	**
4 th	22.62±3.88	23.24±4.28	17.6±4.82	14.33±0.57	17.78±2.68	22.39±4.32	**
5 th	28.62±4.20	30.1±4.24	20.8±4.72	18.0±2.64	22.53±2.84	30.97±4.83	**
6 th	37.62±6.34	39.08±4.50	25.2±6.14	21.33±3.21	30.33±1.52	37.33±3.33	**
7 th	48.12±7.16	48.2±14.80	30.6±6.73	26.16±2.24	33.0±4.33	47.2±4.33	**
8 th	60.87±8.38	66.0±15.78	35.64±7.36	31.33±2.51	44.0±5.29	52.31±3.32	**
9 th	70.62±7.0	79.8±17.12	43.0±8.8	38.33±1.52	52.66±8.02	65.0±4.33	**
10 th	89.25±8.43	98.0±13.54	48.4±8.58	41.66±3.78	69.65±5.33	73.33±5.97	**
11 th	108.87±9.03	115.25±17.37	53.0±9.05	49.0±4.32	75.0±5.97	80.2±2.29	**
12 th	116.6±19.42	127.6±21.49	59.8±8.4	55.9±4.0	81.0±7.9	85.33±4.29	**

Notes: NS= Non significant, *= significant at 1% level (p value < 0.01), **=significant at 5% level (p<0.05).

59.8±8.4kg, 55.9±4.0kg, 81.0±7.9kg and 85.33±4.29kg of Pakhribas, Nagpuri, Hurrah, Hampshire X Hurrah and Pakhribas X Nagpuri respectively. The mean body weight of Nagpuri was found higher than that of Hurrah. Similarly, the mean body weight of Hampshire X Hurrah and Pakhribas X Nagpuri was found higher than those of local breeds like Hurrah and Nagpuri. According to Kumar et al. 2018, adult body weight of Hampshire pig (9th month) was observed 77.25±2.82kg which is almost similar with the finding of our research i.e. 79.8±17.12 kg.

The highest mean of age at 1st mating & age at first farrowing were observed 335±26.8 days & 466±3.21days in Hurrah & Nagpuri breed respectively and the lowest 294±28.20 days & 408±6.9 days in Pakhribas breed. Similarly, the highest mean of weight at 1st mating and litter weight at weaning were observed 95±10.10kg & 9.2±0.28kg in Hampshire and the lowest 52±9.75kg & 5.54±0.97kg in and Nagpuri & Hurrah respectively. Likewise, the highest mean value of litter size at birth & at weaning were observed 11.4±1.6 nos. & 9.4±1.01 nos. in Pakhribas and the lowest 7.56±1.32 nos. & 5.54±0.97 nos. in Hurrah.

The highest mean of weight of piglets at birth, farrowing interval, litter index & piglet mortality were observed 1.2±0.05kg, 207±12.32 days, 1.8±0.24 sow/year & 22±0.96% in Hampshire, Nagpuri, Pakhribas & Nagpuri respectively and the lowest 0.92±0.87kg, 184±32.9 days, 1.5±0.98 sow/year , 18±7.57% in Hurrah, Pakhribas, Nagpuri & Pakhribas respectively.

According to Neopane (2004), Neopane (2006), Neopane and Kadel (2008), weight of piglet at birth and adult of Pakhribas is 1.05kg and 350kg respectively that match the finding of our research in terms of birth weight 1.1±0.08kg but doesn't match the adult body weight 116.6±19.42kg. In this study, the lower value of adult body weight may be due to inbreeding in the herd. Similarly, age of 1st farrowing, litter size at birth, litter size at weaning and farrowing interval were observed 408±6.9 days, 11.4±1.6 nos., 9.4±1.01 nos. and 184±32.9 days which is higher than those of Neopane (2006) 364.2±7.4 days, 9.24±2.87 nos., 8.43±2.7 nos. and 172.8±12.1 days respectively. The higher value may be due to inbreeding problems in Pakhribas breed. In this research, piglet mortality was observed 18±7.57% which is higher than that

Table 3. Reproductive performance of different pig breeds at RARS, Tarahara.

Parameters	Breeds					CV%	F test
	Pakhribas n=7	Hampshire n=7	Puri n=7	Hurrah n=7	Average n=28		
Age at 1 st Mating(days)	294±28.20	301±42.42	322±23.3	335±26.8	313.2±32.20	7.29	**
Wt. at 1 st mating (kg)	78±11.3	95±10.10	52±9.75	58±8.75	70.8±9.63	11.25	*
Age of 1 st farrowing (days)	408±6.9	462±5.59	466±3.21	459±3.12	448.5±4.70	12.52	NS
Litter size at birth (nos)	11.4±1.6	10.5±0.59	10.7±0.98	7.56±1.32	10.04±1.11	11.57	NS
Wt. of piglets at birth (kg)	1.1±0.08	1.2±0.05	0.97±0.86	0.92±0.87	1.02±0.46	8.06	NS
Litter size at weaning (nos)	9.4±1.01	8.28±0.96	6.75±1.24	5.98±0.89	7.6±1.05	12.29	**
Litter wt. at weaning (kg)	8.1±0.75	9.2±0.28	5.64±0.97	5.54±0.97	7.27±0.62	7.06	**
Farrowing interval (days)	184±32.9	192±12.28	207±12.32	197±7.65	195.20±17.34	13.36	**
Litter index sow/year	1.8±0.24	1.8±0.05	1.5±0.98	1.6±0.23	1.7±0.40	4.95	*
Piglet mortality %	18±7.57	19±7.75	22±0.96	21.±0.85	20.6±4.07	13.24	NS

Notes: NS = non significant * = significant at 1% level (p value < 0.01), ** = significant at 5% level (p<0.05).

of 10.4% pre-weaning mortality (Ghimire and Aryal, 1999). Panta (2015) reported higher mortality percentage 47%. Season of birth and managerial stress significantly affected the health traits. The inbreeding affects fitness traits. The increase in piglet's mortality may be due to inbreeding.

According to Neopane and Kadel (2008) weight of piglet at birth of Hurrah local breed is 0.8kg and adult weight is 45kg which do not match the finding of our research in terms of birth weight 0.92±0.87kg and adult body weight 55.9±4.0kg. Similarly, age of 1st mating, age of 1st farrowing and farrowing interval were 335±26.8 days, 448.5±4.70 days and 197±7.65 days respectively which is higher than finding of Dhakal (2012), Pokharel (2012), Pandey (2011) and Thapa (2009) i.e. 241.73±22.13 days, 351.30±4.8 days and 180.30±0.3 days respectively. The higher value may be due to inbreeding problem arise in pig of Regional Agriculture Research Station, Tarahara, Sunsari, Nepal but litter size at weaning (nos.) and litter size at birth were almost similar to the finding of Pradhan (1999), Neopane

(2004). According to Pokharel (2012), Pandey (2011), adult body weight of Local Nagpuri breed was 50-60kg which match the finding of our research i.e. 59.8±8.4kg. Similarly, age at 1st mating, age at 1st farrowing, farrowing interval were 322±23.3 days, 466±3.21 days and 207±12.32 days which were observed higher than those of Dhakal (2012) 213.5±11.14 days, 335.54±9.91days and 170.96±7.28 days respectively.

According to Tummaruk et al. (2001), age at 1st farrowing and farrowing interval of Hampshire pig were found 386 days & 173.4 days which were observed higher in this research finding i.e. 462±5.59 days & 192±12.28 days but litter size at birth & litter size at weaning were almost similar i.e. 10.5±0.59 nos. & 8.28±0.96 nos. respectively. Litter size at birth & litter size at weaning were observed higher than those of Kumar et al. (2018). Similarly, according to Thapa et al. (2018), farrowing interval, litter size at birth and litter size at weaning of Hampshire pig were found 174 days, 8.31 nos. and 7.56 nos. which was lower than our research findings i.e. 192±12.28 days, 10.5±0.59 nos. and 8.28±0.96

nos. respectively. The adult mean body weight was 127.6 ± 21.49 kg which was less than Kumaresan et al. (2006). According to him, average daily weight gain of Hampshire pig was 185 kg. This may be due to inbreeding problem and location of farm is in Sunsari district which lie in terai region and climate over there is hot but Hampshire breed performed better in cold places and could be suitable for temperate environment (Thapa et. al., 2018). Age at 1st mating of Hampshire was 301 ± 42.42 days. Age at 1st service in any of the pig farms should be between 8 & 9 months and if it crosses more than 10 months, then it is advisable to cull these animals (Rymer & Grand, 2009).

Exotic breed Hampshire has the highest body weight than synthetic breed Pakhribas followed by Pakhribas x Nagpuri, Hampshire x Hurrah, Nagpuri and Hurrah. From above findings, the highest body weight was found in Hampshire followed by Pakhribas, Pakhribas x Nagpuri, Hampshire x Hurrah, Nagpuri and Hurrah. Exotic breed like Hampshire has higher body weight than synthetic breed Pakhribas, their cross and local breeds. Similarly, reproductive traits like age at 1st mating, age of 1st farrowing & piglet mortality were observed highest in local breeds Nagpuri & Hurrah followed by Hampshire and the lowest in Pakhribas. Litter size at birth, litter size at weaning & weight of piglets at birth were observed highest in synthetic breed Pakhribas followed by exotic breed Hampshire & Nagpuri and the lowest in Hurrah. Weight at 1st mating & litter weight at weaning were higher in exotic breed Hampshire followed by Pakhribas and the lowest in local breed. Farrowing interval was observed the highest in local breed followed by exotic breed and the lowest in synthetic breed Pakhribas. Litter index sow/year is higher in synthetic & exotic breeds and lower in indigenous breed.

CONCLUSION

The result of this research revealed that the highest body weight was observed in exotic breed Hampshire followed by synthetic breed Pakhribas, Pakhribas x Nagpuri, Hampshire x Hurrah, Nagpuri and the lowest in Hurrah. Exotic breed like Hampshire has higher weight than synthetic breed Pakhribas, their crosses and local breeds. Similarly, reproductive traits like age at 1st mating, age of 1st farrowing & piglet mortality was observed the highest in local breed Nagpuri & Hurrah followed by Hampshire and the lowest in Pakhribas. Litter size at birth, litter size at weaning & weight of piglets at birth were observed the highest in synthetic breed Pakhribas followed by exotic breed Hampshire & Nagpuri and the lowest in Hurrah. Weight at 1st mating & litter weight at weaning were observed the highest in exotic breed Hampshire followed by Pakhribas and the lowest in local breed. Farrowing interval was observed the highest in local breed followed by exotic breed and the lowest in

synthetic breed Pakhribas. Litter index sow/year is higher in synthetic & exotic breed and lower in indigenous breed.

ACKNOWLEDGMENT

This study was supported through a grant from the Nepal Agricultural Research Council (NARC).

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