M. R. Bhosrekar [1]
B. R. Mangurkar [1]
S. G. Patil [1]
J. R. Purghit [1]
P. Humblot [2]
M. Thibier [2]

# Reproductive efficiency and feasability of oestrus control prior to artificial insemination in crossbred bovine females in India

**Efficacité de la reproduction et possibilité de maîtrise du cycle sexuel avant insémination artificielle chez des femelles bovines métisses en Inde — Cette étude a pour but de démontrer l'intérêt pratique de la maîtrise des cycles sexuels des femelles de bovins (*Bos indicus* × *Bos taurus*). 457 génisses et 358 vaches réparties sur fermes d'Etat et fermes villageoises reçoivent les traitements suivants : implants sous-cutanés de norgestomet pour 148 génisses et 127 vaches ; spirales vaginales de progestérone pour 141 génisses et 113 vaches ; injection de prostaglandine (PGF2 alpha) pour 113 génisses de 2 fermes d'Etat ; une injection placebo a été administrée à 93 génisses et 118 vaches qui constituent le groupe témoin. Les 3 premiers groupes sont systématiquement inséminés (2 fois à 24 heures d'intervalles) 2 à 3 jours après la fin du traitement. Le groupe témoin est inséminé après détection de chaleurs spontanées dans les 100 jours de la durée de l'expérience. Le diagnostic de gestation est effectué par palpation rectale, 60 jours environ après la dernière insémination artificielle (I.A.). Les taux de gestation sont identiques pour les vaches et les génisses du groupe traité aux progestatifs. Pour les génisses, les taux de gestation dans chacun des 4 groupes sont de 54 p. 100 (implants) ; 56 p. 100 (spirales) ; 44 p. 100 (PGF2 alpha) ; 48 p. 100 (témoins). Seul le groupe traité au PGF2 alpha a un taux significativement inférieur à celui des 3 autres groupes (p < 0,02). En revanche, pour les vaches, les groupes traités par implants et par spirales ont un taux de gestation (63 p. 100 et 72 p. 100 respectivement) bien supérieur à celui du groupe témoin (48 p. 100 ; p < 0,05).
Les intervalles moyens entre traitement et conception sont significatifs : 56,9 ± 40,7 jours pour les génisses traitées aux progestatifs, contre 67,8 ± 36,6 jours, soit 10 jours de plus pour le groupe témoin (p < 0,025). Pour les vaches, la différence est de l'ordre de 20 jours entre le groupe témoin et le groupe traité (p < 0,001). Le nombre de km nécessaires à l'inséminateur lors de sa première intervention est calculé : il parcourt 7 km en moyenne pour obtenir un résultat sur une femelle témoin, contre 3 km pour une femelle traitée aux progestatifs. En conclusion, cette étude indique qu'une bonne maîtrise des cycles par l'utilisation de traitements progestatifs favorise l'efficacité de l'insémination artificielle et diminue ainsi le nombre, donc le coût des déplacements des inséminateurs.** *Mots clés :* Bovin métis - Vache - Génisse - Cycle œstral - Progestatif - Insémination artificielle - Inde.

## INTRODUCTION

The basic advantages of oestrus control are even more profitable in countries like India than in temperate climates such as those in Western Europe where it was first experienced and now used on a routine manner for more than 10 years (1, 4, 5, 9, 13, 19, 22).

As described previously (3), the advantages are in brief : a great aid in heat detection which is always a major problem for Indian farmers and hence a most valuable tool for applying artificial insemination, itself a key in improving the economical levels of the rural communities of cattle breeders through the greatly improved mean breeding value of the offsprings.

Previous reports in heifers (12) or cows (11) on limited numbers of treated females showed that under competent supervision from trained veterinarians such as those of the BAIF breeding centers, the results in terms of breeding efficiency were quite satisfactory, especially after progestogens treatments. However, these trials were mainly performed in institutional farms and it was not quite clear at this point whether it could also be set up in such a satisfactory manner in individual farms having 1 to 3 cows grouped in rural areas.

In addition, to be of further implement on the field it was necessary to control its feasability not only in terms of follow-up but also on the cost of these operations and more specifically on the mean number of kilometers covered per artificial insemination.

The present study was aimed at investigating comparative efficiency of various oestrus synchronisation treatments and simultaneously evaluating the feasability in terms of kilometers of transport that could be saved with such treatments on groups of cattle.

## MATERIAL AND METHODS

### Animals

This study was performed in Maharastra State of India one year around (February to December) in 10 distinct

1. Bharatiya Agro-Industries Foundation Uruli-Kanchan, Pune, 412202, India.
2. Laboratoire pour le Contrôle des Reproducteurs, Union Nationale des Coopératives d'Elevage et d'Insémination Artificielle, 13, rue Jouët, 94700 Maisons-Alfort, France.

herd entities : 3 institutional farms or individual private herds from 7 villages. The experiments on heifers and cows were conducted simultaneously under the supervision of trained veterinary officers. The females were essentially crossbred (local Zebu breeds × Holstein and local Zebu × Jersey) cows. A total of 457 heifers were here involved from 2 institutional farms and 4 villages. They were on average 21 months old, weighting approximately 250 kg (range 200-300 kg) at the time of treatment. Three hundred and fifty-eight cows were also involved from 3 institutional farms and 2 other villages. The cows had on the average completed 4 lactations, with a wide range (1-8). Their mean calving-to-treatment interval was in the magnitude of 150 days. Their feeding conditions were reckoned to be satisfactory according to local standards. The ration was based on alfalfa (*Medicago sativa*), or local forage in a very similar manner to that previously reported by LOKHANDE *et al.* (11).

## Treatments

The distributions of the heifers and cows according to farms are presented in tables I and II. It follows randomisation prior to treatment within farms or villages for progestogens treatment and controls to the extent possible. In addition, prostaglandin F2 alpha was used here in the institutional farms for treating some of the heifers. The number of females simultaneously treated could vary from 2 to 40. For each treatment day, care was taken that numbers of animals were as similar as possible for all groups.

*TABLE I Distribution of the heifers according to farms and groups.*

| Herds | Implants | Coils | Prostaglandins | Control | Total |
|---|---|---|---|---|---|
| A | 5 | 5 | 8 | 7 | 25 |
| B | 44 | 41 | — | 28 | 113 |
| C | 29 | 28 | — | 16 | 73 |
| D | 5 | 5 | — | 6 | 16 |
| E | 20 | 20 | 67 | 20 | 127 |
| F | 45 | 42 | — | 16 | 103 |
| **Total** | 148 | 141 | 75 | 93 | 457 |

*TABLE II Distribution of the cows according to farms and groups.*

| Herds | Implants | Coils | Control | Total |
|---|---|---|---|---|
| A | 54 | 36 | 45 | 135 |
| E | 5 | 5 | 5 | 15 |
| G | 8 | 7 | 10 | 25 |
| H | 51 | 49 | 50 | 150 |
| I | 9 | 16 | 8 | 33 |
| **Total** | 127 | 113 | 118 | 358 |

Treatments were as follows :

**Group 1** was treated with a subcutaneous implant placed at the outer part of the ear, containing 6 mg of norgestomet (17α-acetoxyl, 11-methyl-19-norpregn-4-ene 3, 20-dione, Intervet, France) and left for 10 days. At the time of insertion, an additional i.m. injection of estradiol valerate (5 mg) + norgestomet (3 mg) was given. PMSG (400 I.U.) was injected 2 days before removal of implant.

**Group 2** was treated in a similar manner for 10 days with a silastic coil so-called Progesterone Releasing Intravaginal Device (PRID-CEVA, France) inserted intravaginally. The coils were having an attached capsule of oestradiol benzoate (10 mg) and the PMSG was administered as above 2 days prior to removal of the coil.

**Group 3** : in 2 institutional farms and only for heifers, the females were injected with a 25 mg dose of prostaglandin F2 alpha (Dinolytic, Upjohn, France) twice at 10 days intervals.

**Group 4** was used as control. The animals in this group were injected with 5 ml of saline at the days treatment started.

In the treated groups, oestrus was carefully checked 2 to 4 days after last treatment. Two AI's were consecutively performed 24 h apart with frozen semen of European breed bulls with known average fertility. Control cows were inseminated on observed heats for the 100 days following the onset of the experiment within groups. For purposes of calculations and comparisons to controls, the two doses of semen inseminated per cow in the treated groups were computed as one AI.

## Statistical analysis

The effects of treatment, herd (or village) in which AI's were performed, and the interaction of herd/treatment on the interval between the beginning of treatment and conception, were estimated simultaneously by two ways non-orthogonal analysis of variance (20). Setting up this field experiment, an effort was made to distribute the animals at random between treatment groups within each village. Analysing the interval between the beginning of treatment and conception, for heifers and cows respectively, 5 and

6 herds (or villages) in which all the 3 treatment groups were represented were taken here into account. Before doing the calculations, a value of 100 days was attributed systematically to all non-pregnant animals since the observations were recorded up to 100 days post-treatment only.

The conception rates on 1st AI and the proportion of non-pregnant cows at the end of the experiment were analysed on the whole set of data by the chi square test (20).

Finally, for heifers and cows, the effects of treatments and herds (or villages) on the mean number of kilometers necessary per first AI were evaluated by analysis of variance. We considered that 4 trips were necessary to inseminate the progestogen-treated groups *vs* one trip for each individual control cow.

# RESULTS

## Heifers

### Conception rates

These refer to all treated heifers that were systematically inseminated and to 62 out of 93 heifers control as 31 of these were never seen in heat for the 100 following days. On the mean, 40 p. 100 of the inseminated females conceived on the first AI.

*TABLE III Pregnancy rates on 1st AI and at the end of the experiment in heifers.*

| Treatment groups | Total | Pregnant on 1st AI | | Pregnant at the end of experiment | |
|---|---|---|---|---|---|
| | | n | (%) | n | (%) |
| Implants + PMSG | 148 | 60/148 | $(40.5)^a$ | 80/148 | $(54.0)^d$ |
| Coils + PMSG | 141 | 55/141 | $(39.0)^a$ | 79/141 | $(56.0)^d$ |
| Prostaglandins | 75 | 18/75 | $(24.0)^b$ | 35/75 | $(44.0)^e$ |
| Controls | 93 | 37/62 (*) | $(59.7)^c$ | 45/93 | (48.4) |

*(*) 31 cows were never observed in heat and consequently were not inseminated.*
*a vs b $p < 0.02$; a vs c $p < 0.01$; b vs c $p < 0.01$; d vs e $p < 0.02$.*

At the end of the 100 days of the experiment, 239 out of 457 heifers involved (52 p. 100), were pregnant. The respective conception rates according to groups are reported in table III. At first AI, there was no significant difference between the two progestogens groups ($p > 0.05$) but the PGF2 alpha had a lower rate ($p < 0.02$) and the inseminated controls a higher conception rate ($p < 0.01$).

The percentage of pregnant cows at the end of the experiment did not differ significantly between groups except that of the PGF2 alpha that is 10 points ($p < 0.02$) lower than those of the progestogens-treated heifers. Finally, the numbers of AI per conception were : 1.25 ; 1.30 ; 2.12 and 1.13 for implants, coils, PGF alpha treated and control heifers respectively ($p > 0.05$).

### Intervals from beginning of treatment to conception

The overall mean interval from the beginning of treatment to conception was evaluated as 62.1 ± 45.6 days after the non-pregnant heifers were assigned the value of 100 days. This interval was submitted to large variations both according to treatments ($p < 0.025$) and herds ($p < 0.001$) as shown on table IV.

The progestogens groups had a mean interval of 56.9 ± 40.7 days *vs* 67.8 ± 36.6 days in controls and 73.5 ± 38.2 days for prostaglandins-treated females.

Moreover the interaction herd/treatment was significant ($p < 0.01$) indicating various effects of the treatment within herds as illustrated on figure 1. Indeed, in 4 of these herds, no difference at all was observed between treated and control groups, and the mean intervals were 67.8 ± 40.3 (herd B); 38.9 ± 34.3 (herd C); 41.3 ± 29.5 (herd D) and 65.9 ± 46.0 (herd F). It is therefore in only 2 of the herds that these intervals were significantly shorter than in controls, the 2 progestogens groups having quite similar results (see herds A and E on figure 1). It is in these 2 herds that

*TABLE IV Analysis of variance for the evaluation of the effect of herd (or village) and treatment on the interval from the beginning of treatment to conception in heifers.*

| Source of variation | Sum of squares | df | M.S. | F | Significance |
|---|---|---|---|---|---|
| Herd | 51 277.12 | 5 | 10 255.4 | 7.18 | $p < 0.001$ |
| Treatment (1) | 6 286.6 | 1 | 6 286.6 | 4.40 | $p < 0.025$ |
| Herd/treatment | 29 048.3 | 5 | 5 809.6 | 4.06 | $p < 0.01$ |
| Residual | 52 187.74 | 370 | 1 427.5 | | |
| **Total** | 614 454.5 | 381 | | | |

*(1) Implants + coils vs Controls.*

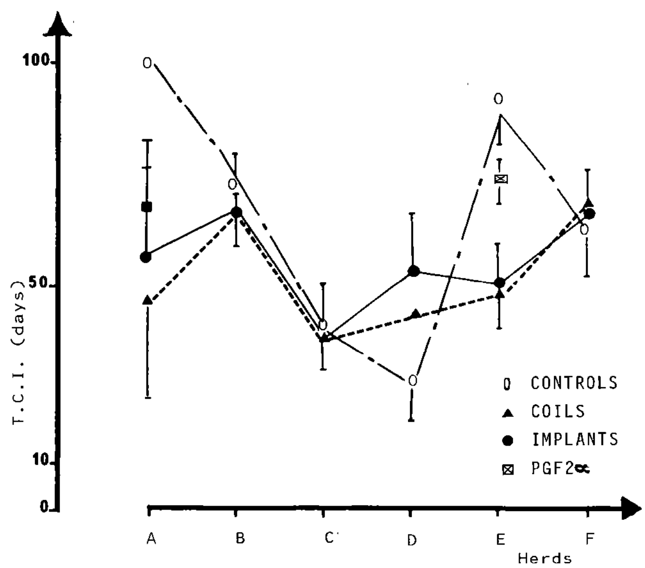


*Fig. 1 : Mean treatment to conception interval (T.C.I., days) and standard error in heifers treated within 6 different herds.*

heifers with prostaglandins and their mean intervals were found to be intermediate between those of the progestogen-treated groups and of the controls.

### Number of kilometers per first AI

Due to the unbalanced numbers between groups the statistical analysis was here only performed on first AI's. As the AI center was located on farm A itself, this study was only performed for the other 5 herds or villages.

As shown on table V, the mean distance travelled per AI was 2.5-3 km per AI in the progestogen groups, this was significantly shorter ($p < 0.01$) than what was necessary for the controls (close to 7 km on the mean), *i.e.* more than twice as many kilometers. The magnitude of the group simultaneously treated also influenced these results. For instance and as an exception in herd C, for implants-treated group, 2 to 4 females were simultaneously treated and treatment occurred on 7 different dates. This resulted in an average number of kilometers of this group higher than that of the controls in this village. As another example, PGF2 alpha that was used in farm E, was injected simultaneously on 9 to 10 cows each time resulting in 2.1 km per treated heifer.

## Cows

### Conception rates

Twenty controls (17 p. 100) were never seen in heat and hence obviously not inseminated. From the remaining 338 cows, 163 (48 p. 100) conceived on the first AI and at the end of the experiment, 218 were pregnant *i.e.* 60.9 p. 100 out of the total number involved. As shown on table VI, no significant difference in the conception rates could be seen among groups at first AI ($p > 0.05$). By contrast at the end of the trial period, more than 60 p. 100 of the treated cows were pregnant *vs* less than 50 p. 100 for controls. Moreover adding together the progestogen-treated cows, the mean conception rate was 67.1 p. 100 significantly higher than that of controls (48.3 p. 100 ; $p < 0.05$).

Finally, from the cow that conceived, there was no significant difference in the number of AI per

*TABLE V Mean number of km per first AI (M.N. km/AI) in each village and each heifer treatment group.*

| Treatment / Herds | Implants | | | Coils | | | Controls | | |
|---|---|---|---|---|---|---|---|---|---|
| | Total km travelled | N (*) | M.N. km/AI | Total km travelled | N (*) | M.N. km/AI | Total km travelled | N (*) | M. |
| B | 40 | 44 | 0.9 | 40 | 41 | 1.0 | 110 | 13 | 8.5 |
| C | 298 | 29 | 10.3 | 80 | 20 | 4.0 | 25 | 6 | 4.2 |
| D | 12 | 5 | 2.4 | 24 | 5 | 4.8 | 30 | 5 | 6 |
| E | 20 | 20 | 1.0 | 154 | 28 | 5.5 | 82 | 13 | 6.3 |
| F | 40 | 45 | 0.9 | 40 | 42 | 0.9 | 103 | 15 | 6.9 |
| **Total** | 430 | 144 | 3.0 | 338 | 136 | 2.5 | 350 | 52 | 6.7 |

*(*) Number of heifers.*

Retour au menu

*TABLE VI Pregnancy rates on 1st AI and at the end of the experiment in cows.*

| Treatment groups | Total | Pregnant on 1st AI | | Pregnant at the end of experiment | |
|---|---|---|---|---|---|
| | | n | (%) | n | (%) |
| Implants + PMSG | 127 | 63/127 | (49.6) | 80/127 | (63.0) |
| Coils + PMSG | 113 | 56/113 | (49.6) | 81/113 | (71.7) |
| Controls | 118 | 44/98 (*) | (45.0) | 57/118 | (48.3) |

*(*) 20 cows were not observed in heat and consequently were not inseminated. a vs b p < 0.05.*

conception, which was 1.23 ; 1.34 ; and 1.23 for the implants, vaginal coils and controls respectively ($p > 0.05$).

## Intervals from beginning of treatment to conception

Under the conditions applied to these females, the mean interval from beginning of treatment to conception was 56.51 ± 37.0 days. Again there were significant effects of both treatments and herds together with that of the interaction as shown in table VII. However as illustrated on figure 2, in all herds, the intervals for the control cows were longer than those of the two progestogens-treated females. No difference was noted between implants and coils ($p > 0.05$) with a mean interval of 50.1 ± 40.8 days *vs* 69.4 ± 22.8 in controls.

Moreover, a careful examination of the data reported in figure 2 clearly indicates that when the numbers of treated cows is high (> 35 females) within each group and herd (herds A and H for instance), the 2 progestogens treatments resulted in very close mean intervals.

*TABLE VII Analysis of variance for evaluation of the effect of herd (or village) and treatment on the interval from the beginning of treatment to conception in cows.*

| Source of variation | Sum of squares | df | M.S. | F | Significance |
|---|---|---|---|---|---|
| Herd | 17 248.55 | 4 | 4 312.14 | 2.90 | $p < 0.05$ |
| Treatment (1) | 29 667.66 | 1 | 29 667.66 | 19.95 | $p < 0.001$ |
| Herd/treatment | 14 955.55 | 4 | 3 738.89 | 2.51 | $p < 0.05$ |
| Residual | 517 456.95 | 348 | 1 486.94 | | |
| Total | 579 073.43 | 357 | | | |

*(1) Implants + Coils vs Controls.*

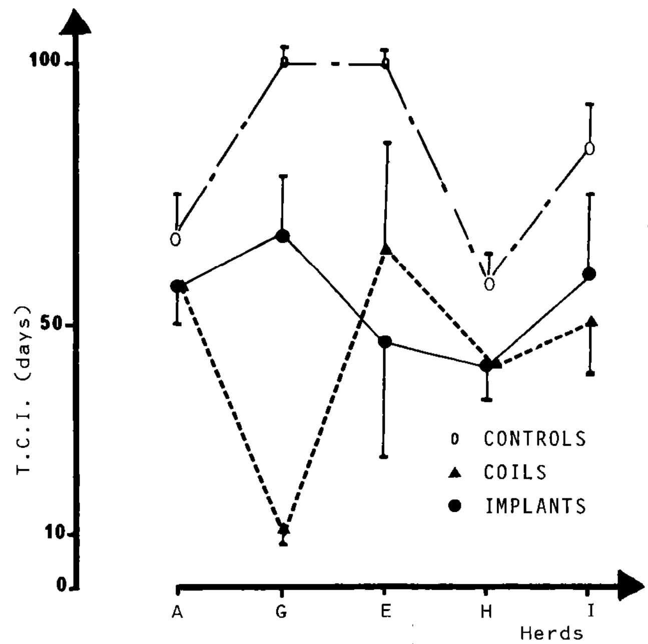


*Fig. 2 : Mean treatment to conception interval (T.C.I., days) and standard error in cows treated within 5 different herds.*

Finally, it is therefore shown here that due to the low interaction effect illustrated by the consistent higher intervals in controls for all herds, conception occurred 20 days earlier in progestogens-treated cows than in controls.

## Number of kilometers per first AI

For similar reasons as those previously stated, this analysis could only be performed in 3 herds or villages (namely G, H, I, see table VIII).

It was found that in progestogens groups, mean distance per first AI was around 3.5 km, and this was half of those necessary (7 km) for controls ($p < 0.001$).

As observed in the heifers experiment the numbers of cows treated simultaneously influenced the mean distance travalled. For instance there were larger groups in implants or coils treatments in village H than in village I. In the latter, for implants treatments, there were 3 different dates and trips for 2, 2 and 3 females. This explains the number of mean kilometers close in this instance to that recorded for controls. These data altogether show that minimum of 7 cows should be treated simultaneously to reduce the travelling by half.

*TABLE VIII Mean number of km per first AI (M.N. km/AI) in each village and each cow treatment group.*

| Treatment | Implants | | | Coils | | | Controls | | |
|---|---|---|---|---|---|---|---|---|---|
| | Total km travelled | N (*) | M.N. km/AI | Total km travelled | N (*) | M.N. km/AI | Total km travelled | N (*) | M.N. km/AI |
| G | 20 | 8 | 2.5 | 20 | 7 | 2.8 | 50 | 10 | 5.0 |
| H | 126 | 51 | 2.5 | 140 | 49 | 2.8 | 346 | 50 | 6.9 |
| I | 100 | 9 | 11.1 | 80 | 16 | 5 | 80 | 8 | 10 |
| **Total** | 246 | 68 | 3.6 | 240 | 72 | 3.3 | 476 | 68 | 7.0 |

*(*) Number of cows.*

## DISCUSSION

The final result of breeding efficiency is a combination of the conception rates achieved after such treatment and the mean period of time necessary for this conception to occur, the latter being directly dependent upon heat detection ability and accuracy.

As far as the heat detection problem is concerned, it was previously shown (11, 12) that all cows were in oestrus 2 to 4 days after end of such treatments. This was here fully confirmed on a larger scale. This contrasts with the non-detected heats in controls during a 90-100 days period that was found here to be around 30 p. 100 in heifers and 20 p. 100 in cows, and that matches almost exactly with what was previously reported in the same area. This shows that the cattle population here involved resembled that which was studied 2 to 3 years before (11, 12). It was however not possible here to determine whether the non-detected females were cycled or not (true anoestrus). GONZALES STAGNARD (8) reported in tropical zone of Venezuela that according to rectal palpations, there were 30 to 40 p. 100 of females that were in true anoestrus.

The pregnancy rates of the controls were again in the same magnitude as those found previously although slightly lower in this study. However, as in the former reports, there was no alteration of those rates in the treated groups for cows. The means observed here match also well with those of GAUTHIER *et al.* (7) referring to limited numbers of cows in the French West Indies. There were here, however, a 10 to 20 points of percentage decrease in pregnancy rate in heifers treated with progestogens when compared to controls. This was not found previously and it could be due to a lower body weight at time of breeding (10, 15, 16). The results observed after PGF2 alpha alone in the 2 herds are again much lower than those in all other groups, and this seems to definetely rule out such PGF2 alpha treatments for heifers.

It should be noted that a double insemination took place in treated females which of course might be a cause of enhanced fertility. It is too early at this time to evaluate the magnitude of the benefits that can result from this practice in comparison to only one insemination. In western countries such as in France, it was shown that a single insemination could lead to a 5-7 points of percentage lower conception rate when compared to 2 AI's. (1). It seems likely that it could be at least of the same magnitude in these Indian cattle herds due to the physiological variations reported on spontaneous oestrus cycles from cows submitted to thermal stress (21).

On the herd management side or more widely on the economics of the farm, the conception rate at 90-100 days after start of treatments might be a better index. This criterion here shows a higher rate by 20 points of percentage approximately in treated cows with progestogens than in the contemporary controls. The difference was lower in heifers although there were 55 p. 100 of them pregnant by then in the progestogen groups compared to 48 p. 100 in controls. This again is in accord with previous work in heifers but is even clearer here than it was in the 1984 report (11).

Retour au menu

The intervals from treatment to conception for those that conceived during the experimental period were definitely lower by 20 and 10 days respectively in cows and heifers than in controls. This is also quite consistent with our previous reports.

Moreover, these mean intervals in progestogens groups both in heifers and cows are in the magnitude of 50 days. That means that the mean period between the first AI following treatment and conception is only of 32 days, which is consistent with the 1.5 inseminations number required per conception. This seems to be quite a short interval further suggesting a clear possibility of having grouped calvings and offsprings. Advantage of this could be taken in the future in selecting most appropriate periods for calvings relative to fodder availabilities or marketing or else for better management (more homogeneous groups of young animals).

The fact that the herds effects and to a lesser extent that of the treatment/herd interaction were significant, indicates that the management of the herds clearly influences the expected results. The present study was not designed to give further information on this point but it agrees entirely with other investigations in temperate climates (6, 17, 18) which stressed the fact that such treatments were only to be used in well managed farms and never to be considered as an infertility therapy. The herds effects were also noted in tropical areas after AI on spontaneous oestrus (14).

As far as the feasability is concerned, the farmers and veterinarians were both satisfied with the trial. It seemed quite practical, as much for daily constraints to the farmers who appeared to be able to adjust satisfactorily as for the veterinarians in the clinical, insemination and management advices duties. The results shown here in terms of kilometers required per first AI clearly showed all the economical benefits, in transportation that could result from such a practice. It seemed clear however that the minimum numbers of simultaneous treated females should be 7. Further saving in time and expenses for transportation could be made if batches of 10-12 females could be simultaneously treated. It seems from foreign experience (18) that 15 females should be the maximum in order to keep the fertility as high as possible. In the present study, it happened that some 20 or more females were simultaneously treated on several occasions. However, the conception rates did not appear to be decreased here although this experiment does not allow us to definetely conclude on this point.

In conclusion, despite a slightly lower conception rate at first AI following treatments and only in heifers, the reproductive efficiency appeared here to be highly and significantly enhanced by progestogens treatments (equally by means of ear implants or vaginal coils), when compared to controls. This confirms the great values of such treatments in solving the heat detection problems in remote village areas. In addition, AI can be performed at a much lower cost. Such progestogens treatment can therefore be now recommended and implemented as a most valuable tool in further extending the benefits of artificial insemination to the cattle herds in tropical countries. ■

**BHOSREKAR (M. R.), MANGURKAR (B. R.), PATIL (S. G.), PURGHIT (J. R.), HUMBLOT (P.), THIBIER (M.).** Reproductive efficiency and feasability of oestrus control prior to artificial insemination in crossbred bovine females in India. *Rev. Elev. Méd. vét. Pays trop.*, 1986, **39** (1) : 129-137.
**The aim of the present field trial is to further investigate the technical benefits and practical feasability of oestrus control in crossbred (*Bos indicus* × *Bos taurus*) females. Total numbers of heifers and cows involved are 457 and 358, respectively. They are located on institutional farms and villages. The females were divided into 4 treatment groups : 148 heifers and 127 cows had norgestomet implants ; 141 heifers and 113 cows had vaginal coils (progestogen) ; in 2 farms the heifers only were submitted to a double injection of prostaglandin F2 alpha ; 93 heifers and 118 cows received a placebo as control group. Females of the treatment groups were systematically inseminated, 2 to 3 days (twice, 24 h apart) after end of treatment, and females of the control group were on observed heats during the 100 days following beginning of treatment within groups. Pregnancy was diagnosed by rectal palpation 60 days approximately after last artificial insemination (A.I.). As far as fertility (conception**

**BHOSREKAR (M. R.), MANGURKAR (B. R.), PATIL (S. G.), PURGHIT (J. R.), HUMBLOT (P.), THIBIER (M.).** Eficacia de reproducción y posibilidad de dominio del ciclo estral antes de la inseminación artificial en las hembras bovinas mestizas en India. *Rev. Elev. Méd. vét. Pays trop.*, 1986, **39** (1) : 129-137.
**Este estudio tiene por objeto de demostrar el interés práctico del dominio del ciclo estral de hembras bovinas (*Bos indicus* × *Bos taurus*). 457 novillas y 358 vacas perteneciendo a granjas de Estado y granjas aldeanas reciben los tratamientos siguientes : implantaciones subcutáneas de Norgestomet para 148 novillas y 127 vacas ; espirales vaginales de progesterona para 141 novillas y 113 vacas ; inyección de prostaglandina (PGF2 alfa) para las novillas de 2 granjas de Estado ; placebo para 93 novillas y 118 vacas que representan el grupo testigo. Se inseminan sistematicamente los 3 primeros grupos (2 veces a 24 horas de intervalo, 2 à 4 días después del fin del tratamiento. Se insemina el grupo testigo después de la detección de celos espontáneos durante los 100 días de la duración de la experiencia. Se efectua el diagnóstico de gestación por palpación rectal, unos 60 días después de la última inseminación artificial.**

**rates) is concerned, there is no difference between progestogens groups both within heifers and cows. In heifers, the conception rates are 54 p. 100, 56 p. 100, 44 p. 100 and 48 p. 100 for implants, coils, PFG2 alpha and controls respectively. Only the PGF2 alpha group has a significant lower rate. By contrast, in cows, the treated groups have a significantly higher mean conception rate (63 p. 100 and 72 p. 100 for implants and coils respectively) than that of controls (48 p. 100 ; $p < 0.05$).**
**Fecundity evaluated by the mean intervals from treatment to conception is significantly influenced by herd and treatment.**
**On the mean, this interval is 10 days longer in controls (67.8 ± 36.6 days) than in progestogens treated heifers (56.9 ± 40.7 days ; $p < 0.025$). Moreover, in cows, this difference is 20 days between controls and treated groups ($p < 0.001$). The feasability is also assessed by the number of km required per first AI's. On the whole, a control female requires 7 km *vs* 3 kg approximately in progestogen-treated groups.**
**In conclusion, the conbination of fertility and fecundity clearly shows a higher benefit of oestrus control in reproductive efficiency in both heifers and cows together with a feasability at a lower cost than inseminating females individually on observed heats.** *Key words :* Crossbred cattle - Cow - Heifer - Oestrus - Progestogen - Artificial insemination - India.

**Las tasas de gestación son idénticas para las vacas y las novillas del grupo tratado con la progesterona. Son de 54 p. 100 (implantaciones), 56 p. 100 (espirales), 44 p. 100 (PGF2 alfa) y 48 p. 100 (testigas) las tasas de gestación de las novillas en cada uno de los 4 grupos. Solo el grupo tratado con PGF2 alfa tiene una tasa significativamente inferiora a la de los 3 otros grupos ($p < 0,02$). En cambio, para las vacas, los grupos tratados con implantaciones y por espirales tienen una tasa de gestación (respectivamente 63 p. 100 y 71,7 p. 100) bien superiora a la del grupo testigo (48,3 p. 100 ; $p < 0,05$).**
**Los intervalos medios entre tratamientos y concepciones son significativos : 56,9 ± 40,7 días para las novillas tratadas con progesterona contra 67,8 ± 36,6 días, sea 10 días más, para el grupo testigo ($p < 0.025$). Para las vacas, es de unos 20 días la diferencia entre el grupo testigo y el grupo tratado ($p < 0,001$). Se calcula el número de km necesarios para el inseminador en el momento de la primera intervención.**
**Recorre 7 km por termino medio para obtener un buen éxito en una hembra testiga contra 3 km para una hembra tratada.**
**En conclusión, este estudio indica que un buen dominio de los ciclos sexuales por la utilización de progesterona favorece la eficacia de la inseminación artificial y asi disminuye el número y en consecuencia el costo de traslados de los inseminadores.**
*Palabras claves :* Bovino mestizo - Vaca - Novilla - Ciclo estral - Progesterona - Inseminación artificial - India.

## REFERENCES

1. AGUER (D.). Les progestogènes dans la maîtrise des cycles sexuels chez les bovins. *Recl Méd. vét. Ec. Alfort,* 1981, **157** (1) : 53-60.
2. AGUER (D.), PELOT (J.), CHUPIN (D.). Comment utiliser les progestogènes pour rompre l'anœstrus *post partum* chez les vaches laitières ou allaitantes. *In :* ITEB éd., La reproduction des bovins. Paris, journées ITEB-UNCEIA, 1982. pp. 19-34.
3. BHOSREKAR (M. R.). Oestrus synchronization in cattle. *BAIF J.,* 1985, **5** (2-3) : 43.
4. BRITT (J. H.). Limitations of the pharmacological control of reproduction. *In :* Proc. 10th int. Congr. Anim. Reprod. AI, vol. 6, Urbana, USA, 1984. pp. 31-37.
5. CHUPIN (D.), PELOT (J.), MAULEON (P.). Improvement of the oestrous control in dairy cows. *In :* SREENAN (J. M.) ed., Control of reproduction in the cow. Current topics in veterinary medicine, vol. 1, 1977. pp. 546-561.
6. CHUPIN (D.), PELOT (J.). Fertility of dairy cows treated with implants prostaglandin analog and PMSG. *Theriogenology,* 1978, **10** : 307-311.
7. GAUTHIER (D.), COULAUD (G.), THIMONNIER (J.). Utilisation en Guadeloupe des techniques hormonales de maîtrise des cycles. *Annls Zootech.,* 1984, **33** : 557-562.
8. GONZALEZ STAGNARD (C.). Comportamiento reproductivo de las razas locales de rumiantes en el tropico americano. *In :* INRA éd., Reproduction des ruminants en zone tropicale, Pointe-à-Pitre, Guadeloupe, 1984. pp. 1-80. (Les Colloques de l'INRA n° 20.)
9. LAUDERDALE (J. W.). Use of prostaglandin F2 in cattle breeding. *In :* EDQVIST (L. E.) & KINDAHL (H.) eds, Prostaglandins in animal reproduction. *Acta vet. Scand. Suppl.,* 1981, **77** : 181-192.
10. LEAVER (J. D.). Rearing of dairy cattle. VII. Effect of level of nutrition and body condition on the fertility of heifers. *Anim. Prod.,* 1977, **25** : 219-224.
11. LOKHANDE (S. M.), INAMDAR (D. R.), JOSHI (B. M.), BHOSREKAR (M. R.), HUMBLOT (P.), THIBIER (M.). Progestogen and prostaglandin combined treatments for synchronization of oestrus in *post partum* crossbred (*Bos indicus* × *Bos taurus*) or Zebu cows. *Rev. Elev. Méd. vét. Pays trop.,* 1984, **37** : 73-78.

12. LOKHANDE (S. M.), PATIL (V. H.), MAHAJAN (D. C.), PHADNIS (Y. P.), HUMBLOT (P.), THIBIER (M.). Fertility on synchronized oestrus in crossbred (*Bos taurus* × *Bos indicus*) heifers. *Theriogenelogy,* 1983, **20** : 397-406.
13. MAWHINNEY (S.), ROCHE (J. F.). Factors involved in oestrous cycle control in the bovine. *In :* SREENAN (J. M.) ed., Control of reproduction in the cow. Current topics in veterinary medicine, vol. 1, 1977. pp. 511-530.
14. MENENDEZ BUXADERA (A.), GUERRA (D.), DOMINGUEZ (A.), RODRIGUEZ (N.), MORALES (J. R.). Seasonal variation in calving interval and its components in Holstein, Zebu, Criollo and Charolais cattle under cuban conditions. *In :* INRA éd., Reproduction des ruminants en zone tropicale. Pointe-à-Pitre, Guadeloupe, 1984. pp. 101-111. (Les Colloques de l'INRA n° 20.)
15. OYEDIPE (E. O.), OSOR (D. I. K.), AKEREJOLA (O.), SAROR (D.). Effect of level of nutrition on onset of puberty and conception rates of Zebu heifers. *Theriogenology,* 1982, **18** : 525-539.
16. PACCARD (P.). L'alimentation et ses répercussions sur la fertilité. *In :* ITEB éd., Physiologie et pathologie de la reproduction. Paris, journées ITEB-UNCEIA, 1977. pp. 124-135.
17. PELOT (J.), CHUPIN (D.), PETIT (M.). Influence de quelques facteurs sur la fertilité à l'œstrus induit. *In :* ITEB éd., Physiologie et pathologie de la reproduction. Paris, journées ITEB-UNCEIA, 1977. pp. 49-52.
18. PETIT (M.), M'BAYE (M.), PALIN (C.). Maîtrise des cycles sexuels. *Elevage Insém.,* 1979, **170** : 7-27.
19. SEGUIN (B. E.). Pharmacologic control of breeding management in dairy cows. *In :* Proc. 10th int. Congr. Anim. Reprod. AI, vol. 4, Urbana, USA, 1984. pp. 25-30.
20. SNEDECOR (G. W.), COCHRAN (W. G.). Statistical method. Ames, Iowa, Iowa State College Press, 1956. 534 p.
21. THATCHER (W. W.), BADINGA (L.), COLLIER (R. J.), HEAD (H. H.), WILCOX (C. J.). Thermal stress effects on the bovine conceptus, early and late pregnancy. *In :* INRA éd., Reproduction des ruminants en zone tropicale. Pointe-à-Pitre, Guadeloupe, 1984. pp. 265-282. (Les Colloques de l'INRA n° 20.)
22. THIBIER (M.). Quelques aspects récents de la maîtrise des cycles de la femelle chez les bovins. *Recl Méd. vét. Ec. Alfort,* 1976, **152** : 433-442.