LAUNCHING WORKSHOP-ICO – CFC- CABI PROJECT

INTEGRATED STEM BORER MANAGEMENT IN SMALL HOLDER FARMS-INDIA , MALAWI, ZIMBABWE

BIO-ECOLOGY OF THE COFFEE WHITE STEM BORER

PRESENTED BY

P. K. VINOD KUMAR

CENTRAL COFFEE RESEARCH INSTITUTE
COFFEE RESEARCH STATION
CHIKMAGALUR DISTRICT
KARNATAKA, INDIA

THE BORER FIRST IDENTIFIED AS

CUCUJUS COFFEEOPHAGUS RICHTER

CURRENT NAME

XYLOTRECHUS QUADRIPES
CHEVROLAT

GROUP: CLYTINI

SUBFAMILY: CERAMBYCINAE

FAMILY: CERAMBYCIDAE

ORDER: COLEOPTERA

IT IS REPORTED FROM

CHINA, INDIA, SRI LANKA, THAILAND, VIETNAM, SOUTH AFRICA

IN INDIA IT IS REPORTED FROM ALL THE REGIONS WHERE ARABICA COFFEE IS GROWN

OTHER RELATED SPECIES

XYLOTRECHUS BASIFULIGINOSUS
X. BUQUETI
X. CARINIFRONS
X. CONTORTUS
X. INCURVATUS
X. RENOMINATUS
X. SMEI
X. STEBBINGI
X. SUBDEPRESSUS
X. SUBSCUTELLATUS

AMONG THEM ONLY *X. SUBSCUTELLATUS* HAS BEEN RECORDED FROM ARABICA COFFEE

HOST PLANTS

COFFEA ARABICA
C. CANEPHORA
C. LIBERICA

	(Vernacular name)
CUDRANIA JAVANENSIS	
GARDENIA SP.	KALLARIGE
IXORA COCCINEA	KEPALA
JASMINUM DISPERMUM	MALLIGE
OLEA DIOICA	KALSADLE
OROXYLUM INDICUM	PATAGANI
RANDIA DUMETORUM	
RANDIA SPINOSA	MANGARI
RHUS SEMICILIATA	
TECTONA GRANDIS	THEGA
WENDLANDIA MYRIATHA	KAARE

REGARDING ALTERNATE HOSTS . . . .

THE BORER IS SAID TO ATTACK LIVING *IXORA COCCINEA* AND *OLEA DIOICA*

IN THE FOREST, IT OCCASIONALLY BREEDS IN DEAD POLES AND STUMPS OF TEAK BUT NOT ON LIVE STEMS

ADULT

ADULT IS A SLENDER BEETLE, ELONGATE, WITH A GREYISH PUBESCENCE ON THE HEAD, PROTHORAX AND ELYTRA

PROTHORAX GLOBOSE WITH A BLACK ROUNDED SPOT ON THE DISC AND TWO SMALLER ONES PLACED ON EACH SIDE

ELYTRA ARE MARKED WITH FOUR PAIRS OF WHITISH MARKINGS WHICH ARE CHARACTERISTIC OF THE SPECIES

LEGS ARE BLACK WITH HIND FEMUR VARYING IN COLOUR FROM DARK RED TO BLACK

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VARIATION IN SIZE OF ADULTS

MORPHOLOGICAL VARIATIONS

V. K. SUBRAMANYAM IN 1941 DESCRIBED SIX TYPE BASED ON COLOUR OF LEGS

A. ALL PAIRS QUITE BLACK

B. TWO HIND PAIRS RED

C. HIND PAIR RED AND MIDDLE PAIR DARK BROWN

D. HIND PAIR RED AND MIDDLE PAIR BLACK

E. HIND PAIR DARK BROWN

F. HIND AND MIDDLE PAIRS DARK BROWN

BEETLES OF CLASS ‘A’ SMALLEST AND CLASS ‘B’ LARGEST

ADULT MORPHOLOGY

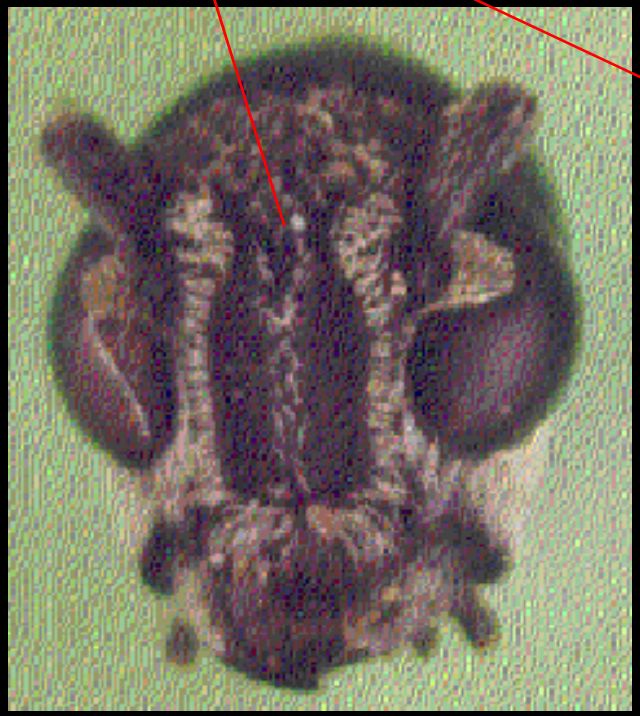
LENGTH OF THE BEETLES IS ABOUT 1 TO 2 CM

MALE GENERALLY SMALLER THAN THE FEMALE. HEAD SHOWS DISTINCTLY RAISED BLACK RIDGES AND THE HIND LEG FEMUR EXTENDS BEYOND THE APEX OF THE ELYTRA

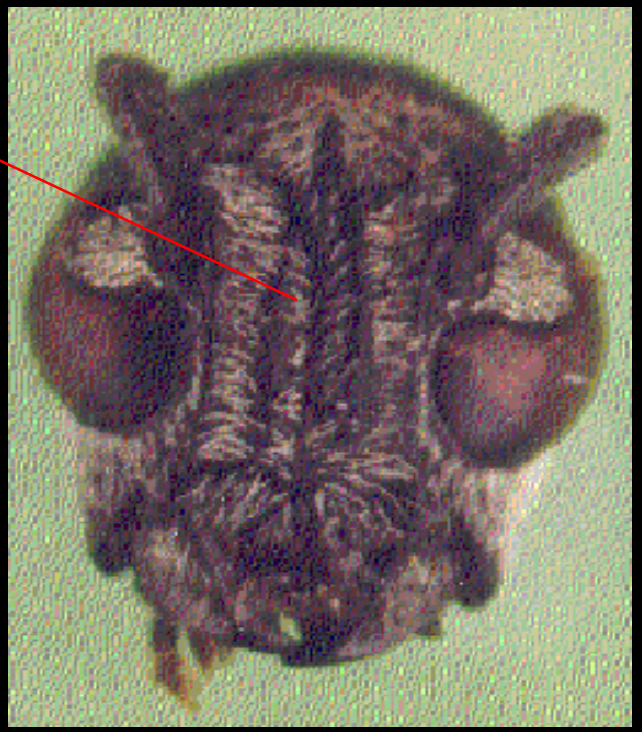
IN THE FEMALE THE BLACK RIDGES ON THE HEAD ARE NOT MUCH CONSPICUOUS AND THE HIND LEG FEMUR DOES NOT EXTEND BEYOND THE APEX OFTHE ELYTRA

Look here to see the difference

SEX DIFFERENTIATION



HEAD OF MALE



HEAD OF FEMALE

Look here to see the difference

SEX DIFFERENTIATION

ADULT BEHAVIOUR

ACTIVITY	WINTER FLIGHT PERIOD	SUMMER FLIGHT PERIOD
MAXIMUM FLIGHT ACTIVITY	10.00 AM– 2.00 PM	10.00 AM– 2.00 PM
AVERAGE DURATION OF FLIGHT	3.98 SEC/FLIGHT	2.28 SEC/FLIGHT
FLIGHT ACTIVITY IN BRIGHT WEATHER	83.87%	82.75%
FLIGHT ACTIVITY IN CLOUDY WEATHER	16.13%	17.25%

ADULT BEHAVIOUR

	WINTER FLIGHT PERIOD	SUMMER FLIGHT PERIOD
MAXIMUM MATING	10.00 AM– 4.00 PM	10.00 AM– 4.00 PM
AVERAGE DURATION OF MATING	10.66 SEC	9.67 SEC
MATING - IN BRIGHT WEATHER	88.89%	94.58%
MATING - IN CLOUDY WEATHER	11.11%	5.42%

COURTSHIP BEHAVIOUR

SIGHT DOES NOT PLAY ANY ROLE IN IDENTIFICATION OF MATES

VIRGIN MALES AND FEMALES WITH THEIR ANTENNA REMOVED FAILED TO RECOGNISE EACH OTHER INDICATING THE ROLE OF CHEMICALS IN MATE RECOGNITION

BOTH MALES AND FEMALES OF THE BORER PRODUCE SEX PHEROMONE FOR ENHANCING MATING SUCCESS

POSSIBLY THE MALE PRODUCES A PHEROMONE ACTING AT A LONG RANGE BUT THE COPULATION SUCCESS IS ACHIEVED BY SHORT RANGE PHEROMONE PRODUCED BY THE FEMALE

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ADULT BEHAVIOUR – EGG LAYING

	WINTER FLIGHT PERIOD	SUMMER FLIGHT PERIOD
MAXIMUM EGG LAYING	12.00 AM – 4.00 PM	12.00 AM – 3.00 PM
AVERAGE DURATION	12.5 SEC	10.6 SEC
EGG LAYING – IN BRIGHT WEATHER	80.00%	88.42%
EGG LAYING - IN CLOUDY WEATHER	20.00%	11.58%
EGG LAYING - ON MAIN STEM	98%	78.57%
EGG LAYING - ON BRANCHES	2%	21.43%

OVIPOSITION

IT IS NOT A CONTINUOUS PROCESS

MATING TAKES PLACE IN BETWEEN PERIODS OF EGG LAYING

FEMALES MOVE ABOUT ON THE COFFEE STEMS SEARCHING FOR CRACKS, AND CREVICES UNDER THE SCALY BARK

THE NUMBER OF EGGS LAID VARY FROM 1 TO 10 IN A SINGLE SITUATION

DISSECTION OF FEMALE BEETLES SHOWED AN AVERAGE OF 120 EGGS PER FEMALE

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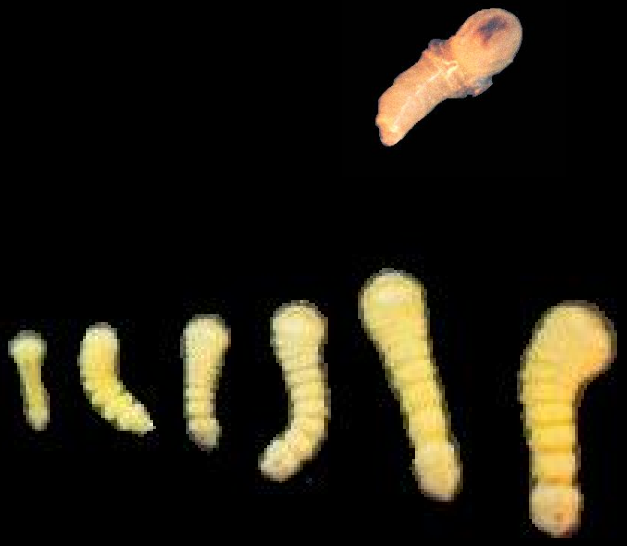
LIFE CYCLE

Eggs

First instars

Pupa

Prepupa



Larval stages

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TUNNELS MADE BY EARLY INSTAR LARVAE

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India Coffee
Taste Nature

कॉफी बोर्ड
COFFEE BOARD

FULL GROWN GRUB PUPATES IN A HOLLOW CHAMBER NEAR THE OUTER SURFACE OF THE STEM AFTER CUTTING A CIRCULAR DISC BENEATH THE BARK

THE PUPAL PERIOD LASTS BETWEEN 25-35 DAYS

ADULT AFTER EMERGENCE FROM THE PUPA, REMAINS IN THE PUPAL CHAMBER FOR 3-7 DAYS

EXIT HOLE ON THE STEM IS THE INDICATION THAT BEETLES HAVE ALREADY EMERGED

PUPAL CHAMBER

EMERGENCE

EMERGENCE HAD A POSITIVE SIGNIFICANT CORRELATION WITH TEMPERATURE, HUMIDITY AND SUNSHINE HOURS

THE BEETLES REQUIRE A HIGH HUMID WEATHER COMBINED WITH LONGER PERIOD OF BRIGHT SUNSHINE FOR THE EMERGENCE

EMERGENCE WAS MORE ON THE SUNNY DAYS FOLLOWING HEAVY RAINS

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BEETLES AFTER EMERGENCE ARE VERY ACTIVE IN BRIGHT AND HOT WEATHER AND READY TO MATE ON THE SAME DAY

FEMALES ARE MORE IN NUMBER THAN MALES

A FEMALE CAN LAY ABOUT 100 EGGS IN A LIFE SPAN OF 9 - 30 DAYS

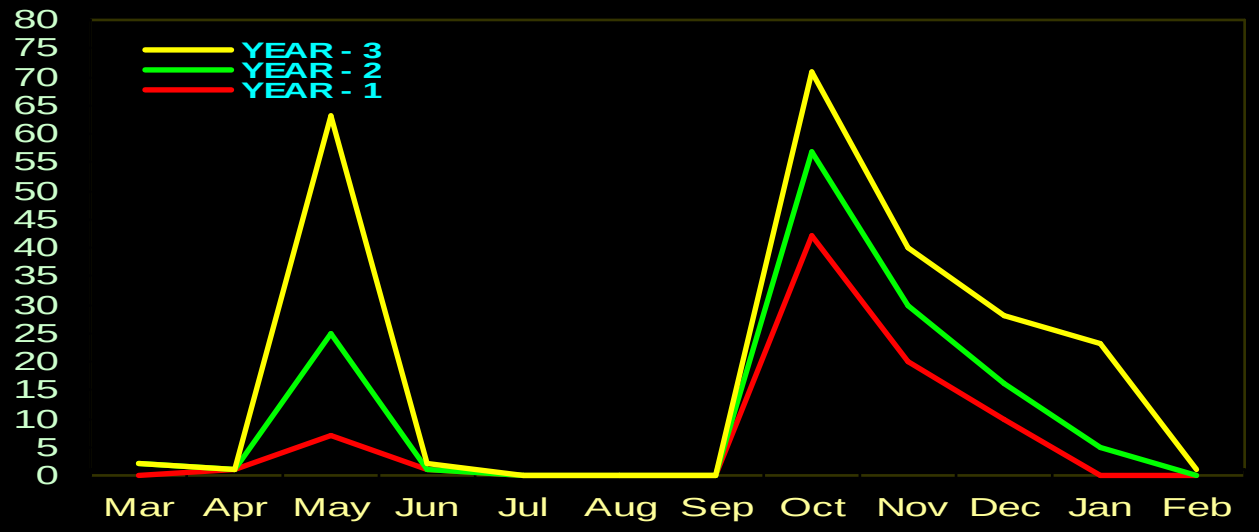
EGGS HATCH IN 8-11 DAYS AND HATCHABILITY IS 80%

EMERGENCE / FLIGHT PERIOD

TWO PEAK EMERGENCE PERIODS OF THE BEETLE ARE NOTICED

ONE DURING APRIL - MAY AND THE OTHER DURING OCTOBER - DECEMBER

STRAY EMERGENCE NOTICED IN OTHER MONTHS ALSO



LIFE CYCLE DURATION

COMPLETES IN ABOUT A YEAR ON LIVING PLANT, BUT IT TAKES LESSER TIME ON DRYING OR UPROOTED COFFEE STEMS. SHORT LIFE CYCLE OF SIX MONTHS HAS ALSO BEEN RECORDED FROM THE FIELD

LIFE CYCLE COMPLETED IN ABOUT 75 DAYS ON CUT STEMS OF 1.5 CM DIAMETER AND 13 CM LENGTH IN THE LAB

IN THE FIELD THE BORER TOOK UPTO 397.2 DAYS TO COMPLETE LIFE CYCLE ON ROBUSTA

IN THAILAND, BORER COMPLETED LIFE CYCLE IN 95 DAYS ON CUT STEMS IN THE LAB AND 172 DAYS IN THE SCREEN HOUSE

INFLUENCE OF WEATHER

BEETLES ARE ACTIVE ONLY DURING THE DAY TIME WHEN THE WEATHER IS BRIGHT AND HOT

INACTIVE DURING CLOUDY AND MOIST CONDITIONS

HEAVY NORTH-EAST MONSOON LESSENS BEETLE ACTIVITY

CLOUDY AND WET WEATHER DELAY THE EMERGENCE OF THE BEETLES

MORE EGGS ARE LAID ON STEMS EXPOSED TO SUNLIGHT

DAMAGE TO PLANTS

EXTENSIVE TUNNELING LEADS TO CUTTING OFF OF SAP SUPPLY

YOUNG PLANTS SUCCUMB FASTER WHILE OLDER PLANTS CAN WITHSTAND ATTACK FOR A FEW SEASONS

INFESTATION RESULTS IN REDUCED CROP AND OCCURRENCE OF MORE FLOATS

APART FROM CAUSING DIRECT CROP LOSS, BORER ATTACK RESULTS IN ADDITIONAL EXPENDITURE ON REPLANTING AND MAINTENANCE

SCREENING VARIETIES FOR TOLERANCE

TRIALS WERE CONDUCTED AT CCRI USING CUT STEMS OF 17 SPECIES (NOT COMMERCIALLY CULTIVATED) OF COFFEE

MAXIMUM EGG LAYING WAS OBSERVED ON VARIETY 'QUILLO' FOLLOWED BY RACEMOSA

TUNNELING WAS OBSERVED IN 11 SPECIES WITH MAXIMUM IN LIBERICA

PHYSICAL AND BIOCHEMICAL ASPECTS OF HOST PLANTS

AS PER EARLIER REPORTS, MOISTURE CONTENT OF THE COFFEE STEM PLAYS A VERY IMPORTANT ROLE IN LARVAL DEVELOPMENT

BIOCHEMICAL ANALYSIS OF THE STEM SHOWED MOSTLY CELLULOSE AND LIGNIN

THE DENSITY OF ARABICA WOOD WAS 1.15 G/CM^3 COMPARED TO 0.95 G/CM^3 OF ROBUSTA

ESTIMATION OF PROTEIN CONTENT IN THE STEMS OF CAUVERY, S.795, AND ROBUSTA INDICATED MORE IN CAUVERY (10.61 MG/G FRESH WT.) FOLLOWED BY S. 795 (6.90) AND ROBUSTA (4.80)

AREAS REQUIRING FURTHER PROBE

POPULATION DYNAMICS WITH REFERNCE TO VARIETIES AND CLIMATIC CONDITIONS

LIFE TABLE STUDIES

ALTERNATE HOSTS OF THE BORER

BIOCHEMICAL ASPECTS OF THE STEM WITH REFERENCE TO HOST PREFERENCE

FIELD TOLERANCE OF COFFEE VARIETIES

‘DOUBTING THOMAS’ IS THE PATRON SAINT OF SCIENTISTS BECAUSE IF HE DID’NT THEY WOULD’NT GET THE EVIDENCE

THANK YOU