```
Data: Set the control parameters of the ABC algorithm
SN: Number of Foods
limit: Maximum number of trial for abandoning a source
MFE: Maximum number of fitness evaluations
begin
    //Initialization;
    num_eval ⟵ 0 ;
    for s = 1 to SN do
        X(s) ⟵ random solution by Eq. 1 [3];
        f_s ⟵ f(X(s));
        trial(s) ⟵ 0;
        num_eval + + ;
    end
    repeat
        //Employed Bees Phase;
        for s = 1 to SN do
            x′ ⟵ a new solution produced by Eq. 2 [3];
            f(x′) ⟵ evaluate new solution;
            num_eval + +;
            if f(x′) < f_s then
                X(s) ⟵ x′; f_s ⟵ f(x′); trial(s) ⟵ 0;
            else
                trial(s) ⟵ trial(s) + 1;
            end
            if num_eval == MFE then
                Memorize the best solution achieved so far and exit main repeat;
            end
        end
        Calculate the probability values p_i for the solutions using fitness values by Eqs. 3 and 4 [3];
        //Onlooker bee phase;
        s ⟵ 1; t ⟵ 1 ;
        repeat
            r ⟵ rand(0, 1);
            if r < p(s) then
                t ⟵ t + 1;
                x′ ⟵ a new solution produced by Eq. 2 [3];
                f(x′) ⟵ evaluate new solution;
                num_eval + +;
                if f(x′) < f_s then
                    X(s) ⟵ x′; f_s ⟵ f(x′); trial(s) ⟵ 0;
                else
                    trial(s) ⟵ trial(s) + 1;
                end
                if num_eval == MFE then
                    Memorize the best solution achieved so far and exit main repeat;
                end
            end
            s ⟵ (s mod SN) + 1;
        until t = SN ;
        //Scout Bee Phase;
        mi ⟵ {s : trial(s) = max(trial)};
        if trial(mi) >= limit then
            X(mi) ⟵ random solution by Eq. 1 [3];
            f_mi ⟵ f(X(mi));
            num_eval + + ;
            trial(mi) ⟵ 0;
            if num_eval == MFE then
                Memorize the best solution achieved so far and exit main repeat;
            end
        end
        Memorize the best solution achieved so far;
    until num_eval = MFE ;
end
```

Algorithm 1: The pseudo-code of $ABC_{imp1}(FEs)$

Data: Set the control parameters of the ABC algorithm
SN: Number of Foods
limit: Maximum number of trial for abandoning a source
MCN: Maximum number of cycles
begin
  //Initialization;
  $num\_eval \longleftarrow 0$;
  for $s = 1$ *to* SN **do**
    $X(s) \longleftarrow$ random solution by Eq. 1 [3];
    $f_s \longleftarrow f(X(s))$;
    $trial(s) \longleftarrow 0$;
    $num\_eval + +$;
  end
  $cycle \longleftarrow 1$;
  while $cycle < MCN$ **do**
    //Employed Bees Phase;
    $mi \longleftarrow \{s : trial(s) = max(trial)\}$;
    for $s = 1$ *to* SN **do**
      if $(trial(s) < limit$ *or* $s != mi)$ **then**
        $x' \longleftarrow$ a new solution produced by Eq. 2 [3];
        $f(x') \longleftarrow$ evaluate new solution;
        $num\_eval + +$;
        if $f(x') < f_s$ **then**
          $X(s) \longleftarrow x'$; $f_s \longleftarrow f(x')$; $trial(s) \longleftarrow 0$;
        else
          $trial(s) \longleftarrow trial(s) + 1$;
        end
      end
    end
    Memorize the best solution achieved so far;
    //Scout Bee Phase;
    if $(trial(mi) >= limit$ **then**
      $X(mi) \longleftarrow$ random solution by Eq. 1 [3];
      $f_{mi} \longleftarrow f(X(mi))$;
      $num\_eval + +$;
      $trial(mi) \longleftarrow 0$;
    end
    Calculate the probability values p_i for the solutions using fitness values by Eqs. 3 and 4 [3];
    //Onlooker Bees Phase;
    $s \longleftarrow 1$; $t \longleftarrow 1$;
    while $t \leq SN$ **do**
      $r \longleftarrow rand(0, 1)$;
      if $r < p(s)$ **then**
        $t \longleftarrow t + 1$;
        $x' \longleftarrow$ a new solution produced by Eq. 2 [3];
        $f(x') \longleftarrow$ evaluate new solution;
        $num\_eval + +$;
        if $f(x') < f_s$ **then**
          $X(s) \longleftarrow x'$; $f_s \longleftarrow f(x')$; $trial(s) \longleftarrow 0$;
        else
          $trial(s) \longleftarrow trial(s) + 1$;
        end
      end
      $s \longleftarrow (s \ mod \ SN) + 1$;
    end
    Memorize the best solution achieved so far;
    $cycle + +$;
  end
end

Algorithm 2: The pseudo-code of the $ABC_{imp2}(FEs)$